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MAGAZINE

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New Programs Complete
The Windows 95 Picture



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First Looks

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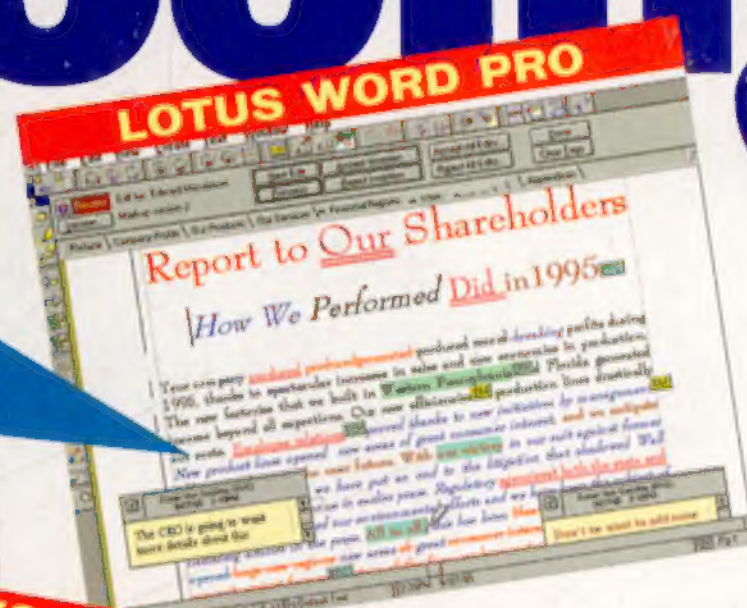
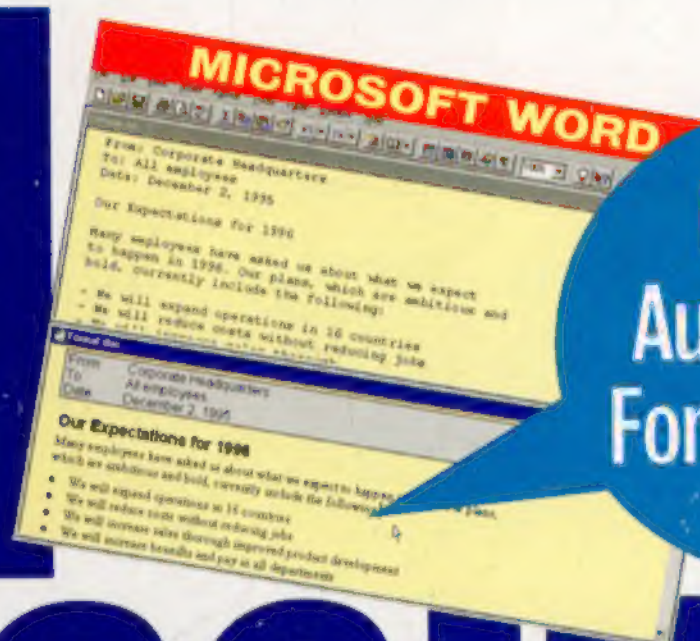
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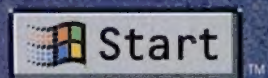


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Inside

No single product category demonstrates the swift development so common to the personal computer industry as the field of word processing does. Just a few years ago we had no trouble finding almost 60 packages to review in an annual *PC*

Magazine roundup of word processing software. Today, it's hard to find even a dozen products to test. And in truth, only three play a major role in this market.

Even so, there's still much to review, ponder, and write about when it comes to word processors. For one thing, the products are much more complex and feature-packed than they were a few years ago. Yet, thanks to the addition of context-sensitive help, wizards, and auto-correction functions, they are also easier to use, more intuitive, and more responsive.

Windows 95 signals a whole new era of word processing, one that will bear close scrutiny in the coming year as adopters of the new OS take a fresh look at newly available products in categories such as word processing, spreadsheets, graphics, and presentations.



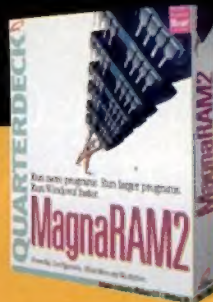
**Software specialists:
Willmott, Ulanoff,
Gottesman, Smith,
and Moller.**

Speaking of a fresh look, our *PC Magazine* software team has some new faces and a refocused outlook. Under the continued direction of executive editor Don Willmott, the job of coordinating our business and graphics software coverage now falls to senior associate editor Lance Ulanoff, who until recently was in charge of our graphics coverage. Lance is assisted in the labs by software technical director Ben Gottesman and associate project leader Dan Smith as well as by editorial researcher Arie Moller.

The team, ably supported by a number of contributing editors—in particular Edward Mendelson, an eight-year contributor to *PC Magazine* who wrote much of this issue's word processing feature—has a full plate of projects in the coming year as we delve deeper into a new era of PC software.—

Michael J. Miller

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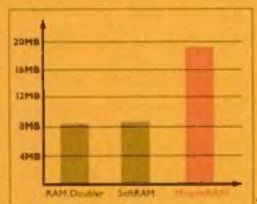
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*Test was performed using an HP Vectra 486u/33M, 16 MB RAM, running Windows 3.1, Solitaire, Microsoft Works, Lotus 1-2-3, MS-DOS, Shoot Video Light, Corel Draw 5.0, Adobe Photoshop, VidGrid, and Corel Chart. Test conducted with products available at the time.
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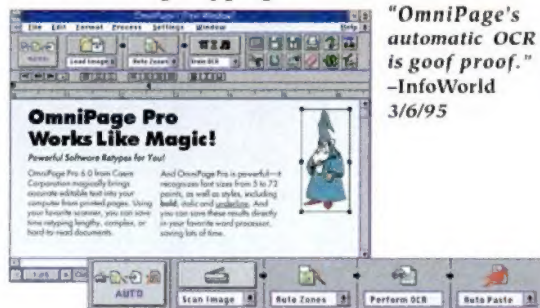
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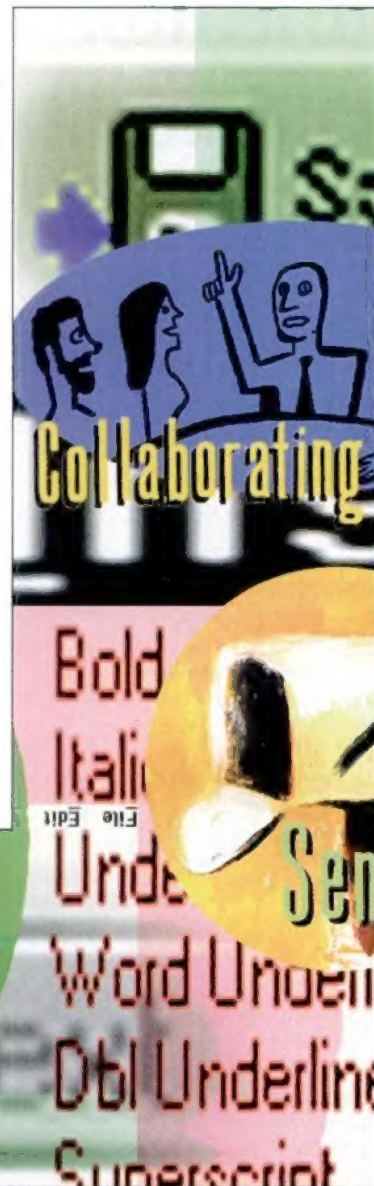
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WORD PROCESSORS

Front & Center

BY EDWARD MENDELSON

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LAN TAMERS



BY STEVE RIGNEY Sometimes you need to put a leash on the beast that is your network. Network management suites give you a central toolkit to keep a close eye on your network and catch problems before they occur. They also save you from tedious manual chores, such as visiting hundreds of client PCs to install software patches. We rounded up five network management suites and rated them on a variety of day-to-day administration tasks. We also examine Microsoft Systems Management Server and Novell's ManageWise, and we compare several standalone utilities for application metering, virus scanning, and server monitoring.....237

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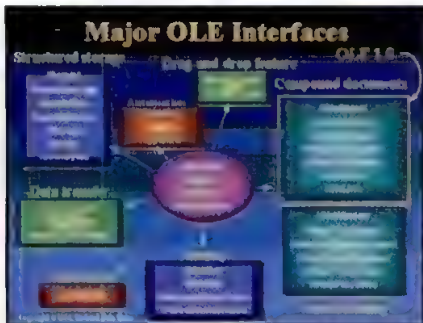
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Dell's featured computer artist is Max Seabaugh of San Francisco





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WM You can even get WinFax PRO

as part of new Delrina CommSuite™ 95, the complete, affordable, integrated communications software solution for Windows 95. WM All of which should suffice until the new alpha wave faxing program is ready. (Hmm.

Perhaps if we partition your brain so that one half can receive faxes while the other remains undisturbed...)

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multi-tasking, multi-threading talents for true background faxing, greater speed and more. But it doesn't stop there. WM With the new TalkWorks™ telephony option and your voice modem, WinFax PRO 7.0 turns your computer into an integrated in-box for faxes, e-mail and voice mail. It even takes phone messages, distinguishes

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Letters



As a trustee of The Ansel Adams Publishing Rights Trust, as Ansel Adams's longtime associate, and as his authorized biographer, I read with astonishment Bill Machrone's column railing against the concept of digital art and The Ansel Adams Screensaver in particular ("Digital Art Isn't," August 1995). Mr. Adams devoted extraordinary effort throughout his life to seeking the ultimate printed reproduction, but he always insisted that it should be a simulation—and not a facsimile—of the original print. He was absolutely fascinated by the potential of the computer and saw it as the logical next step in the evolution of photography, including his own.

The loss of resolution in digital art that is mourned by Machrone is offset by the gain in image luminosity. The result arguably represents an equal, better, or even different simulation of an original print than that found in the finest book, which is the medium Machrone advocates for viewing reproductions of art work. After all, books suffer from most of the same problems as computers when it comes to presenting the "subtleties and surface complexities" that Machrone notes are lacking in digital renditions of art.

W.A. TURNAGE, *Mill Valley, California*

Machrone seems to lead a pretty pointless crusade against digital art. He says that the visual complexity of digital reproductions cannot approach that of the originals, to which I say, "No kidding!" But that's not the point. Digital reproductions aren't meant to replace the originals; rather, they're meant to show a copy. What's wrong with a digital tour through the Louvre or the Uffizi? Most of us can't afford the costs involved in seeing the real thing.

MICHAEL WESTERMANN,
via PC MagNet

Machrone asks if the reader has ever seen an Ansel Adams photograph. Yes, I have. And although I agree that the images are indescribably beautiful, I could also argue that the photograph is nothing compared with actually standing there and viewing the landscape Mr. Adams photographed. After all, Mr. Adams shot in black and white. What about the infinite subtle colors he was unable to capture in his photographs? As Machrone says,

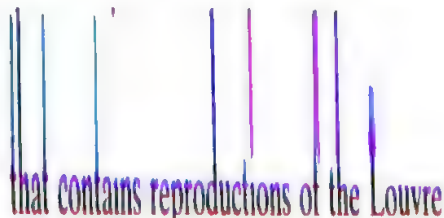


**Digital reproductions aren't
meant to replace originals;
they simply provide a copy.**

Although in principle I have to agree with much of what Machrone said, the reference to Ansel Adams was poorly chosen. Mr. Adams was one of the earliest photographers to embrace the digitization of photographs. Photography has always had many specific limits as a media, limits that have been greatly extended by the attachment of digital capabilities. Now I can do things I just dreamed of during my first 40 years as a photographer. Just as in the past coffee table books extended people's exposure to art, I don't see a computer screen as being any less of a way to convey a representation of works of art.

DAVID B. BROOKS, *via the Internet*

After reading Machrone's column, I realized how much of a cultural philistine I've been. I'm so ashamed for having received so much pleasure from sterile, empty art reproductions. Now, thanks to Machrone, I've seen the light. Not only have I purged my drives of all of my now pointless .GIF images of Monet, Degas, Renoir, et al and replaced them with flying toasters and Mandelbrot images, I've also burned all of my nonoriginal artworks. Moreover, to prove that I am now a serious student of real art, I've just now turned off the Mozart flute and harp concerto I was listening



that contains reproductions of the Louvre paintings, I can only praise the lively commentary on that CD, made possible by the interactive qualities of this technology. The best printed book will never be able to reproduce such a pedagogical tour de force, and I say so as one who lives 30 minutes from the museum and has an annual pass to the Louvre. Plus, the potential for new three-dimensional viewing technologies is enchanting. I only wish to suggest that there is a place for CDs and computer technology in transmitting visual and plastic works of art and that if these tools are well used, they can be invaluable complements to live experience of these works of art.

PETER LEE, *Franconville, France*

RELIABILITY RATINGS

The most striking finding detailed in your typically excellent review of PC vendors' service and reliability ("Service & Reliability: Are You Getting What You Need?" July 1995) was that 28 percent of all PCs needed service in the first year. High failure rates like these make it even more essential than ever that vendors be prepared to offer quality service and support to users.

WILLIAM ROTHSTEIN,
Baltimore, Maryland

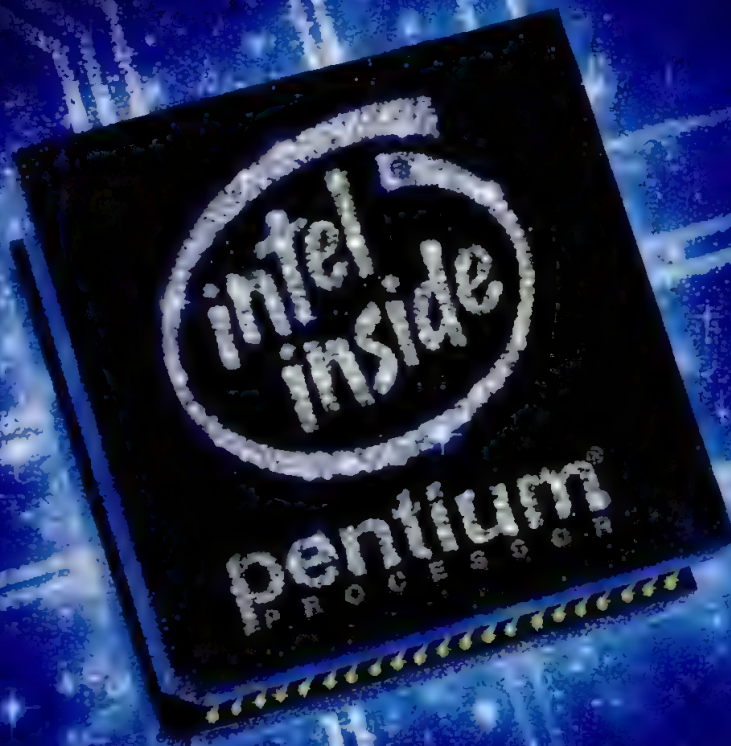
Finally! You've published the bad news about some of the PC vendors. Maybe now the offending vendors will take customer service more seriously.

HENRY KNOLL, *Stillwater, Minnesota*

Although your annual Perfect PC and service and reliability issue was great, I would suggest that you boost the significance of the availability of weekend technical-support service. It's ridiculous how many companies continue to offer tech support only on weekdays. The computer market is being driven more and more by sales to home users; we use our PCs in the evenings and on the weekends. If a problem arises Friday night, we shouldn't have to wait until Monday morning to get help, when we won't be near our computers. Endless phone menus, fax-back services, and FAQs aren't sufficient. Service is one way for companies to stand out from the crowd. Those vendors who continue to ignore the need for weekend support don't deserve our patronage.



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Letters

the column seems to imply; instead, what people fear is the fact that technology is moving so quickly that each month they'll have to continue to buy hundreds or thousands of dollars worth of new hardware and software just to keep up, let alone stay ahead. The endless and rapidly changing choices have left users bewildered and confused—and more than just a little bit timid.

LANA LORENZEN, *via the Internet*

IN THE DRIVER'S SEAT, TAKE THREE

The recent roundup, "Your New OS and Your Peripherals: The Driver Manual," (September 12, 1995) contained incorrect information regarding the compatibility of Reveal products with Windows 95. All Reveal sound cards, CD-ROM drives, modems, and video cards have drivers available that are Windows 95-compatible. Since your issue's publication date, Reveal has also released drivers that are optimized for Windows 95. Updated drivers will be available at no charge via Reveal's online forums on CompuServe, the Internet, and Prodigy.

BOB ANDERSON,
Vice President, Marketing,
Reveal Computer Products,
Woodland Hills, California

THE POWER ADVANTAGE

Your First Looks review of the new Macintosh clones ("Power 100: The Macintosh's Identical Twin in Everything but Price," August 1995) was quite an enjoyable read. Reviews such as this one, which report on the competition, are useful to educated PC users who'd like to investigate all of the alternatives

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CORRECTIONS AND AMPLIFICATIONS

The price stated for the Royal Media Master ("Setting the Pace," September 26, 1995) did not include the monitor. The correct price of the entire package, including a 17-inch monitor, is \$3,595.

The correct phone number for CYMA Systems, discussed in the "Late Out of the Gate" sidebar to our accounting story ("The Bottom Line on Windows," October 10, 1995) is 800-292-2962.

before making the decision to buy a computer. Competition in the monopolized Mac market will help drive the prices down, leading to price wars similar to those in the PC market. As the line grows ever fuzzier between PCs and Macs, I hope to see more articles about the Power Macs and Power PCs in *PC Magazine*. Keep up the good work!

STEPHEN GAEDE, *via PC MagNet*

REMEMBERING THE FUTURE

John C. Dvorak (Inside Track, August 1995) paints a reasonable scenario of Intel getting too big for its britches. Sigh; just what we need, another memory famine. If Intel tries to tie up the memory market as well, then I hope somebody at the Justice Department keeps current with *PC Magazine* and stays on Intel's case. Meanwhile, we do have AMD, Cyrix, and for big power, the DEC Alpha and PowerPC series of chips. So if Intel wants to play the market game that MIPS did with the Altair, it might find exclusivity isn't always what it's cracked up to be.

SCOTT SCHRADER,
Little Canada, Minnesota

A LAN FOR THE HOME

Although I'm sure many SOHO users enjoy and employ the many suggestions made by Bill Howard ("When the Bits Hit the Fan," August 1995), especially those with money to spend, this time he's gone too far. His suggestion for "family area networks," in particular the use of 10Base-T and a network hub, is like using a sledgehammer to crack walnuts. 10Base2 is not as fragile as he claims (his analogy with Christmas lights in series is really wrong: parallel is more like it). And additionally the hassle due to the "network going down" is not as severe as he indicates with only two or three networked computers. As for wiring your house for network cable: Don't go tearing down the walls yet. By the time your refrigerator is SNMP-enabled, the cabling standard is sure to have changed.

WARREN M. GRIFFITH, *via the Internet*

In a day and age when most of the computer world is afraid to edit their WIN.INI files, does Howard really expect people to go out and buy the hardware necessary for a LAN, configure it correctly, and then install all the software for it? And 2 years from now, these same people will set up file servers in their own home? What for, pray tell? Why would any family need a file server at home? Because the

average family 2 years from now will be running DB2 or need to replicate the latest version of DOOM via a Notes server? Or will the latest version of Compton's Encyclopedia soon be available only if you're running an AIX box and only be accessibly via TCP/IP or netBIOS? I can see it now: Setting up the household LAN will become a family activity!

CHRISTIAN CHEN, *via the Internet*

3-2-1 CONTACT

Your article on contact managers was terrific ("Sharing the Wealth," August 1995). I've been looking for just such information since I grew frustrated with PackRat.

JEFF MALACHOWSKY, *via the Internet*

FORTUNE TELLERS

The Trends story on photonic computer configurations of the future ("Your Dream PC: 2005," August 1995) begins "Ten years from now, a mainstream computer may run at a clock speed of 10 gigahertz, pack a gigabyte of memory and 100 gigabytes of storage. . ." Yeah, and by then, Microsoft Word may only require 40 gigabytes of storage.

CHRISTOPHER FISH,
Sandy Hook, Connecticut

TAKE IT WITH YOU

Jim Seymour's column "Tucking a Home PC Under Your Arm" (September 12, 1995) left me with a few unanswered questions. It seems to me that if you take a computer with you on vacation and let the kids play with it, there's a really good chance of someone dropping it or maybe even sending it headlong into the lake. I realize, though, that one should probably be as cautious with a notebook as an average family on vacation should be with a camcorder or some other complicated consumer product. Still, I'm dubious of the durability of today's notebooks.

JOHN EVERETT, *via the Internet*

Seymour's taking a computer on vacation just prompts me to suggest Seymour get a life. Doesn't vacation mean getting away from it all? He did one thing right: He got about as far away as possible in northern Canada. Then he had to spoil it by bringing his link to the past. To top it all off, Seymour was proud. I'm glad that I can remember the days when a vacation was really a vacation, and you cut the cord with the working world. Between pagers, cell phones, and notebooks, we are now electronically leashed.

DARRELL BRIGGS, *via the Internet*

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May 1995

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May 1995

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➤ 4MB RAM ➤ 260MB IDE hard drive ➤ 800: Internal 35" 1.44MB floppy drive ➤ MS-DOS 6.2 & Windows for Workgroups 3.11 ➤ MS Works			➤ 8MB RAM ➤ 350MB IDE hard drive ➤ 35" 1.44MB floppy drive. 400: External, 800: Internal ➤ Custom nylon carrying case ➤ MS Windows 95 or MS-DOS 6.2 & Windows for Workgroups 3.11 ➤ MS Works 95 or MS Works			➤ 8MB RAM ➤ IDE hard drive. 400: 350MB, 800: 528MB ➤ 35" 1.44MB floppy drive. 400: External, 800: Internal ➤ 14.4 PCMCIA fax/modem ➤ Custom carrying case. 400: Leather, 800: Nylon ➤ Extra battery ➤ MS Windows 95 or MS-DOS 6.2 & Windows for Workgroups 3.11 ➤ MS Works 95 or MS Works		
Pentium® Processor	850C		Pentium® Processor	850C		Pentium® Processor	850C	
75MHz			75MHz			75MHz		
90MHz	\$3195		90MHz	CNI \$3695		90MHz	CNI \$4195	
	\$3395			\$3895			CNI \$4395	
➤ 8MB RAM, 256K synchronous SRAM cache ➤ 528MB IDE hard drive ➤ Internal 35" 1.44MB floppy drive ➤ Integrated 16-bit stereo sound ➤ MS Windows 95 or MS-DOS 6.2 & Windows for Workgroups 3.11 ➤ MS Works 95 or MS Works			➤ 16MB RAM, 256K synchronous SRAM cache ➤ 810MB IDE hard drive ➤ Internal 35" 1.44MB floppy drive ➤ Integrated 16-bit stereo sound ➤ Custom nylon carrying case ➤ Extra battery ➤ MS Windows 95 or MS-DOS 6.2 & Windows for Workgroups 3.11 ➤ MS Office Pro 95, or MS Office Pro			➤ 16MB RAM, 256K synchronous SRAM cache ➤ 1.3GB IDE hard drive ➤ Internal 35" 1.44MB floppy drive ➤ Integrated 16-bit stereo sound ➤ External amplified speakers ➤ 28.8 PCMCIA fax/modem ➤ Custom nylon carrying case ➤ Extra battery ➤ MS Windows 95 or MS-DOS 6.2 & Windows for Workgroups 3.11 ➤ MS Office Pro 95, or MS Office Pro		

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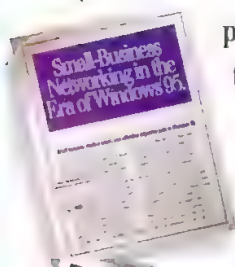
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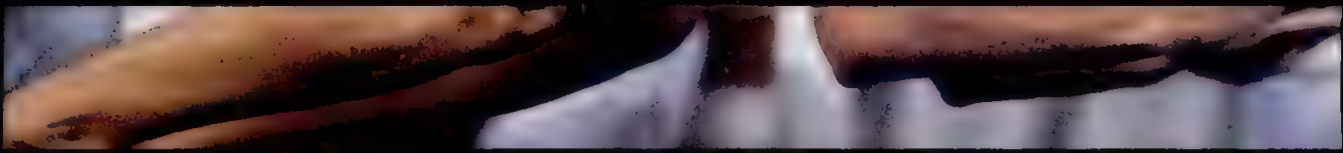
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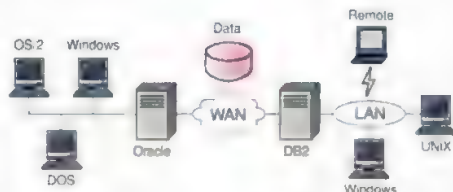


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Trends

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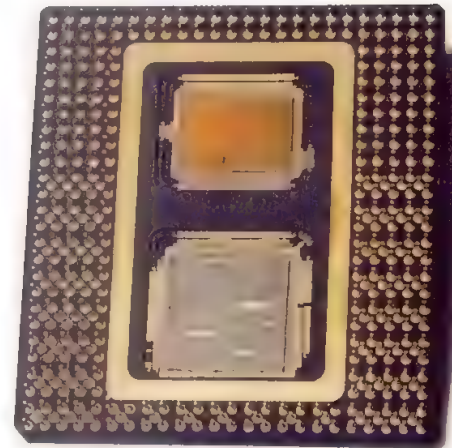
Pentium Pro Repositioned

Intel aims new chip at workstation market.

The Pentium Pro—code-named the P6—is finally here. But a chip that was once viewed as another quantum generational leap for the x86 platform has gone through one repositioning after another.

In an effort to leverage Pentium recognition, Intel decided to extend the Pentium brand name rather than give the chip its own identity. The company also announced that the chip will be targeted at workstations and servers—not desktops—for some time to come. (This followed reports, including *PC Magazine's* story of September 12, 1995, that

er for microprocessors at Sun Microsystems, doesn't think the Pentium Pro is ready for widespread workstation use. "Applications in the workstation market have huge data sets, and issues like bandwidth and multi-processing are key requirements in this market," says Von Clemm. The Pentium Pro's 64-bit-wide data path is half that of the Sun



The Pentium Pro, with 256K of on-board cache, is not targeted initially for mainstream PCs.

benchmark test summary), and the competitive prices that Pentium Pro workstations will have. Still, Von Clemm says, "Intel's experience with personal productivity applications is much greater than its experience with workstation-class applications."

Intel's Pentium Pro focus is clearly not on the desktop, with Intel CEO Andy Grove confirming that Pentium CPUs with faster clock speeds will be the company's desktop offerings. Some competitive chipmakers see huge opportunities on the desktop. Cyrix Vice President Steve Tobak says, "Intel's crystal ball wasn't clear with the Pentium Pro. They bet on a faster move to 32-bit computing than has taken place, and it will be years before that transition happens in volume." Tobak calls Cyrix's recently released M1 "a true sixth-generation processor that has an evenly straddled approach to 16-bit and 32-bit computing." AMD, NexGen, and the PowerPC consortium also have desktop-focused Pentium Pro-class chips.

With systems arriving, the Pentium Pro's impact will soon be clearer, and some are convinced that neither workstation-class chips nor next-generation desktop chips threaten Intel's Pentium-on-the-desktop, Pentium-Pro-at-the-high-end strategy. Jeffrey Friedrichs, director of product marketing at Toshiba, has this to say about alternative processors to Intel's x86 offerings: "People buy processors out of fear of the unknown, rather than from confidence. They're basically conservative about what CPUs they buy and use. This is likely to hold back any major effort to break into Intel's hold on the market."—*Sebastian Rupley*

Workstation-Class Microprocessors

	DEC Alpha	PowerPC 604	Pentium	Pentium Pro	UltraSPARC-1
Top speed	266 MHz	133 MHz	133 MHz	150 MHz	167 MHz
Process technology	0.5-micron BiCMOS	0.5-micron BiCMOS	0.8-micron BiCMOS	0.6-micron BiCMOS	0.35-micron BiCMOS
Transistors	9.3 million	3.6 million	3.1 million	5.5 million	5.2 million
L1/L2 cache	16K, 96K	16K	16K, External	16K, 256K companion chip	16K, External
Instructions per cycle	4	4	2	3	4
SPECint92 score	290 SPECmarks	180 SPECmarks	78 SPECmarks	258 SPECmarks	240 SPECmarks
Maximum power	45W	12.6W	13W	20W	23W
Price of typical system	\$6,800	\$6,500	\$4,500	\$8,000	\$20,000

the chip has negligible performance impact on 16-bit applications, and that Windows NT—not Windows 95—is the operating system best suited to the chip.) Then the company announced that the expected initial wave of symmetrical multiprocessing (SMP) systems will be delayed because of I/O-, and BIOS-related design problems.

No SMP servers? Negligible impact on the current installed base of 16-bit software? Where is this much heralded chip actually headed now that systems are here?

Pentium Pro workstations are a primary focus for Intel, but the competition is skeptical. Peter Von Clemm, product-line manager

for microprocessors at Sun Microsystems, doesn't think the Pentium Pro is ready for widespread workstation use. "Applications in the workstation market have huge data sets, and issues like bandwidth and multi-processing are key requirements in this market," says Von Clemm. The Pentium Pro's 64-bit-wide data path is half that of the Sun

Ultrasparc's, and the UltraSparc's cache goes to 4MB, as opposed to the Pentium Pro's 256K cache. Von Clemm also says the Ultrasparc's floating-point unit and unique pixel engine, which allows caches to be bypassed, are big advantages over the Pentium Pro. Other makers of workstation-class chips, including Digital Equipment Corp., point to much faster clock speeds than the Pentium Pro's.

In defending the Pentium Pro as a workstation-class chip, Intel has emphasized its performance running Windows NT, which is impressive (see the P6 stories on our Web page at <http://www.pcmag> for a complete

Pipeline By Jake Kirchner

Multitasking, Sure, but Are You Multithreaded?

I would be an unrestrained proponent of wireless networking were it not for that slight twinge of guilt I feel every time I open my notebook PC during an important meeting and start answering e-mail or browsing the Web.

And why shouldn't I feel guilty? After all, this multitasking activity is not like well-accepted doodling or note-taking, which may or may not denote your complete mental absence from the matter at hand. The vague nature of those traditional meeting distractions allows a polite suspension of judgment on the part of the attendees. No, there simply is no disguising the blatantly nongermene nature of e-mail tending and Net surfing when you're banging away on your keyboard in the quiet moments of the desultory meeting chatter so common to your average office powwow.



Now that wireless extensions to the office local area network are well within the price range of most organizations, you can expect to have to deal with this office-etiquette question soon. Believe me, the severity of the situation grows in direct proportion to the number of people who are "electronically elsewhere" during a meeting. The first time your eight-person meeting includes four laptops just whaling away on their keyboards, you can be sure someone among the wireless disenfranchised will speak up, demanding "What is it with you guys? Are you all playing a game of Hearts or something?" Trust me, I've been there.

As you can read in our First Looks article on wireless networking at *PC Magazine*, the untethered LAN has come to our

lives big time. When we first installed this marvel of modern communications, I was the first in line to try it. In the intervening weeks, literally everyone on the staff who has a notebook and has been able to browbeat or bribe our network manager for a wireless PCMCIA LAN adapter has joined the parade of staffers wandering from meeting to meeting seemingly surgically attached to their notebook PCs.

The attraction is understandable. Who does not sit through far too many meetings that require only minimal—or sporadic—participation? Why shouldn't we use the time to answer e-mail, draft memos, update our calendars, or write columns (weekly status meeting, mid-September—sorry guys)?

In many cases, my continuous connectivity has been a boon to the discussion at hand. In a meeting concerning on-line publishing, a question arose about a certain home page. I was able to connect to it via our LAN by using the Quarterdeck Mosaic browser installed on my Toshiba Portege. I then connected the notebook to the meeting room's large monitor so that everyone in the room could view the home page live.

In other meetings, I've been able to retrieve information from corporate databases without sending someone racing down the hall to his PC. I've been able to send queries to staffers not present and get responses in real time rather than having to tell the meeting: "I'll have to check that and get back to everyone later."

In more cases than not, I'm spending my wireless networking time catching up on e-mail. But so far I haven't succumbed to the temptation to send messages to my assistant along the lines of "Quick: This meeting is death; please hurry in and announce that my helicopter is warming up in the parking lot."

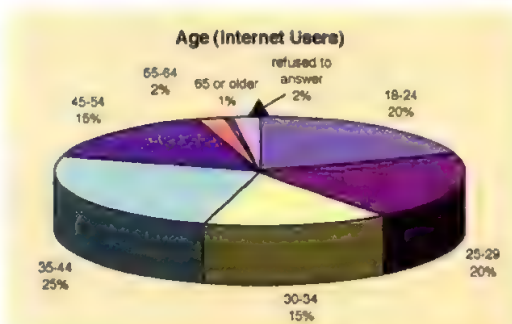
And despite what anyone around here might tell you, I have not whiled away even one weekly management meeting playing network DOOM with the guy sitting across the table. I can't—he's always too busy paying his bills electronically.

Jake Kirchner is the editor of PC Magazine.

Do You Fit the Internet Profile?

AS INTERNET USAGE BOOMS, SO does all the hype. But the results from several recent surveys paint the clearest picture yet of the habits and demographics of Internet users. Most of the surveys have focused on larger issues, such as the total number of Internet users, but more detailed information is emerging, too.

According to the Online Research Group's survey of 1,500 randomly selected Internet users, women make up 34 percent of the Internet-using population. When it comes to household income, the survey points primarily to middle-class users, with few very-high and very-low income users. And 43 percent of Internet users have incomes from \$35,000 to \$75,000 a year; 7 percent of users have household incomes from \$100,000 to \$150,000; and less than 1 percent have incomes above \$200,000 a



According to a survey by the Online Research Group, 25 percent of Internet users are 35 to 44 years old.

year. Less than 3 percent of Internet users have household incomes under \$15,000 a year, and 16 percent have household incomes from \$15,000 to \$35,000 a year.

Internet users are a younger crowd,

according to the survey. The results show that while 15 percent of users fall in the 45 to 54 age range, only 3 percent are 55 or older. The largest age group of users is 35- to 44-year-olds, who make up 25 percent of the Internet crowd. At 20 percent of the Internet-using population, 18- to 24-year-olds are well represented.

Very large companies and very small companies are likely to be heavy Internet users. Companies with more than 10,000 employees make up the largest single group (19 percent of survey respondents) who said their employees are "frequent users." But companies with fewer than 50 employees make up the second-largest single group, with 18 percent saying their employees are frequent Internet users. And 16 percent of companies employing from 1,001 to 5,000 employees said their employees are frequent users.

—Sebastian Rupley

Two-Way Paging Networks

MOBILE PROFESSIONALS KNOW that wireless data communications devices have been expensive, bulky, and plagued with poor data-transmission quality and short battery lives. The new SkyTel 2-Way paves the way for a new generation of products and services that will make two-way wireless messaging affordable and truly portable.

But the promise of personal communications devices hasn't exactly been met. The first wave of two-way services will be somewhat limited (messages must be less than 1K) and targeted mainly toward current pager users. With the SkyTel 2-Way alphanumeric pager developed by Motorola, you can acknowledge receipt of a message or reply to the sender with one of several preset responses.

To explore other applications for its network, SkyTel, a subsidiary of Mobile Telecommunication Technology Corp. (Mtel), has reached out to the PC industry. Hewlett-Packard Co. is one of the first vendors teaming up with SkyTel. HP will include software in its HP 100LX and 200LX palmtop PCs for sending and receiving alphanumeric messages via a connected SkyTel 2-Way pager. And messaging software for Windows 95 (to be available free from The Microsoft Network and from Microsoft's Web site) will let you send and receive messages over the SkyTel network. Microsoft Network users will also be able to access the SkyTel two-way pagers from the Exchange in-box.

SkyTel has linked its network to the Internet, too. To send a message to a SkyTel pager, you need only address the e-mail to the recipient's pager number at *destineer.com*. If the recipient has a two-way pager, you will receive 1 of 16 preprogrammed responses to your e-mail in-box.

Eventually, paging components will be built into notebook PCs. Other wallet-size devices will incorporate handwriting-recognition with two-way messaging so you will be able to scribble a note and send it from anywhere.

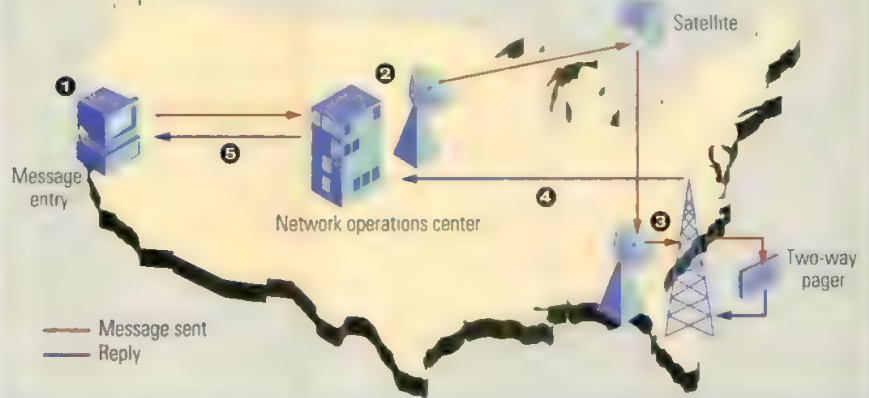
While other two-way wireless messaging technologies have been around for some time, SkyTel's 2-Way is the first service to use narrowband personal communications service (PCS) frequencies licensed from the FCC last year. For sending more than just pager-length messages (longer than 500 characters), you will have to rely on something other than a narrowband PCS. Cellular Digital Packet Data (CDPD)

networks and two private wireless-data companies, Ardis and RAM Mobile, have expanded in the past year, and have announced an agreement for interoperability. Eventually these networks hope to have

as extensive a reach as paging networks do now. Other companies that are developing nationwide two-way paging systems—AT&T, MobileMedia Corp., and Paging Network—are expected to have similar services available by the end of 1996. Regional providers are also expected to introduce two-way paging services using narrowband PCS frequencies.—*Todd Spangler*

SkyTel's Messaging Loop

A message entered via e-mail goes directly to SkyTel's network operations center (1). The message is routed through SkyTel's satellite (2). From the downlink, the message is sent to a local transmitter and to the recipient's pager (3). The reply is routed by the transmitter back to the network operations center (4). The response message is returned to the sender's e-mail address (5).



Disk Accord Averts Standards War

THERE'S BEEN A LOT OF TALK THE past few years about the entertainment and computer industries converging, but now that major players from both industries have agreed on a single digital format for storing movies, games, and PC applications, that prospect is close at hand.

Until recently, it looked like two competing standards—the Multimedia CD backed by Sony and Philips Electronics, and the Super Density (SD) disk backed by Toshiba, Time Warner, and several other companies—would hit the market and confuse customers. But the Hollywood Video Disc Advisory Group and the Computer Industry Technical Working Group insisted on a single format and refused to endorse either proposal. Given this incentive, both sides sat down and hammered out an agreement late last summer. By agreeing on a unified format that combines elements of both approaches, the two camps have avoided a replay of the VHS/Betamax battle and have given the software, hardware, and movie industries an impetus for putting their products on an aggressive launch schedule.

The high-density digital disk will be dual-

layered and dual-sided, storing about 9 gigabytes of data per side. The SD Alliance contributed the 0.6-mm disk, which is half as thick as a CD-ROM—yet more data-dense. A 135-minute movie, with Dolby sound and subtitles, can be stored on one side. The format will support greater capacities once blue lasers are commercialized. The signal modulation technique, developed by Philips, vastly eases compatibility with existing CD-ROMs.

The compromise standard averts another problem. "Confused customers won't buy," says Rob van Eijk, director of CD-recordable products at Philips. With just one standard, consumers won't have to pick a format and then hope they bet on the winner. You can expect to see high-density disk players in the third quarter of 1996. Content providers are also working on digitally formatted material. Philips' Polygram Film Entertainment arm expects to produce 150 titles next year.

Will consumers replace their VCRs and CD-ROMs with new players? PC users may be more inclined to buy since some titles now fill multiple disks, but consumers satisfied with the quality of their VCRs may need further persuasion.—*Carol Levin*

Internet Rating System Underway

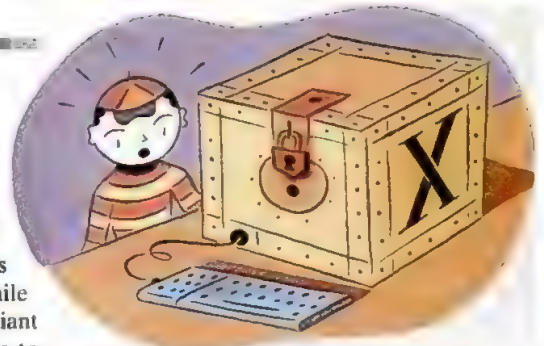
WITH THE RECENT FORMATION OF the Platform for Internet Content Selection (PICS), the focus of Internet content filtering has shifted from public decrees to private choices. The PICS initiative was launched by an eclectic group of companies, including Apple, IBM, Netscape, Microsoft, the major on-line services, AT&T, MCI, and Time Warner. Instead of defining a public standard for the restriction of Internet material, the initiative will allow individual users and organizations to define their own standards via a common platform.

Public restriction of the Internet is exemplified by the U.S. Senate's Communications Decency Act, which seeks harsh penalties for those who post pornography and profanity on the Internet. The U.S. House of Representative's Internet Freedom and Family Empowerment Act shifts some control to the individual user, but it still requires the industry to set specific standards for content filtering.

PICS takes the House's efforts one step

further by providing a common platform for individual rating systems, rather than an immovable standard. Just as the common rules of basketball allow for different defenses, PICS lets you specify your own restrictions while retaining compatibility with PICS-compliant filtering packages. Parents will be able to create their own methods of restriction or defer to the methods of a third-party, such as Disney or the Christian Coalition.

Two existing Internet filter developers—SafeSurf and SurfWatch—are part of the new consortium and are attempting to incorporate their methods into the master platform. The PICS initiative, however, does not include NetNanny, owners of the



popular NetNanny filtering package.

By the beginning of the year, PICS expects to finalize methods for rating sites and demonstrate a filter package for the new platform. If Congress fails to pass a common Internet restriction act, decisions concerning what is offensive on the Internet will remain in the hands of the individual.—Sarah L. Roberts and Cade Metz

The Internet Telephone Game

IF YOU THINK THE COMPETITION for your long-distance phone service is cut-throat, just wait until businesses and homes ramp up to use the Internet as a telephone. VocalTec, the first company to launch software for making calls over the Internet, has been working busily since the launch of Internet Phone early this year, closing deals with manufacturers for bundling the software with modems and sound chips. So far, says Elon Ganor, president of VocalTec, half a million people own a copy of Internet Phone.

Meanwhile, Quarterdeck has been remaking itself, acquiring companies with promising Internet technologies and aggressively going after Internet users with a series of products including a Web browser, a server, an authoring tool, and WebPhone. While both companies have very different corporate strategies, they both have big plans in store for low-cost phone service and collaborative computing over the Internet.

VocalTec's goal is to become the de facto standard for voice communication over the Internet. The company has made bundling deals with 19 manufacturers, including the audio chip maker Crystal Semiconductor as well as modem makers Boca Research, Motorola, Reveal, and Zoom Telephonics.

VocalTec isn't new to voice-processing technology. Started in 1989, the company has been devoted entirely to voice processing over computers. VocalTec's expertise in the advanced algorithms required for voice processing, Ganor says, gives the company an edge over Quarterdeck.

The key component needed for transmitting voice over the Internet is the global directory, used to locate and connect callers. The directory concept holds great potential beyond its use as an Internet "411" operator. It's a meeting place for people to find others with similar interests, explains Ganor.

Quarterdeck also has big plans for leveraging its own directory, known as the Rendezvous Server, as a virtual meeting place. Future WebPhone services, which are similar to extra phone features you can order, could include call waiting, conference calling, and speed dialing as well as video-conferencing and live-document sharing, explains Robert Kutnick, chief technology officer at Quarterdeck.

Quarterdeck CEO Gaston Bastiaens sees WebPhone as only the latest piece of Quarterdeck's strategy for collaborative computing over the Internet. It now owns Prospero Systems Research of San Francisco, which developed WebPhone's Rendezvous Server. And the company recently invested in several Internet companies, including Lernout & Hauspie Speech Products of Brussels. Bastiaens says the company has a voice compression codec that produces voice quality with reduced latency, comparable to the normal sound of voice over the phone, yet requiring less bandwidth.

As with most fledgling technologies, standards issues and incompatibilities inevitably make life difficult. Today, if I'm using WebPhone and you're using Internet Phone, we can't talk.—Carol Levin

Top Retail Software

Current ranking	Last issue	Product/company
1	1	SoftRAM 95 Synchronys Software
2	6	MS Plus! for Windows 95 Microsoft Corp.
3	5	MS Windows 95 Upgrade Microsoft Corp.
4	—	Netscape Navigator Personal Edition Netscape Communications Corp.
5	—	Easy Tutor Learn Windows 95 CRT Multimedia
6	—	Procomm Plus for Windows 2.11 Datastorm
7	—	MS-DOS 6.22 Upgrade Microsoft Corp.
8	—	WordPerfect 6.1 Upgrade Novell Inc.
9	—	Mosaic in a Box for Windows 95 2.0 CompuServe Internet Division
10	—	QEMM 386 7.5 Quarterdeck

This list ranks PC business programs according to the total number of copies shipped to over 12,000 stores and resellers in the week ending September 16, 1995; the list cannot be interpreted as a picture of the entire software market. Adapted from a compilation by Ingram Micro.

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DOS

- MS-DOS 5.0 and IBM PC compatibility



Data Comm

- Industry standard data communication ports: serial, infrared, and PC/MC IA Type II



Laplink Remote

- Transfer files from other PCs with Laplink or File Transfer PC connectivity kit



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Lotus 1-2-3

- Lotus spreadsheet, including graphics, macros and database commands



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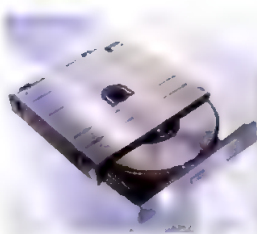
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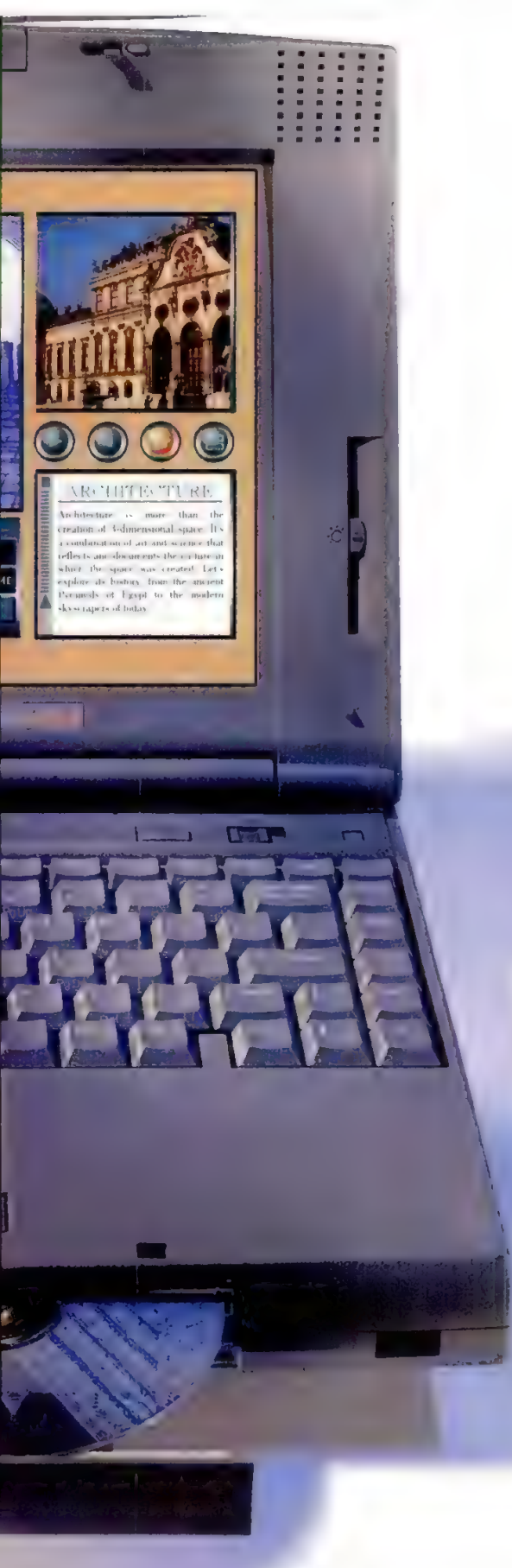


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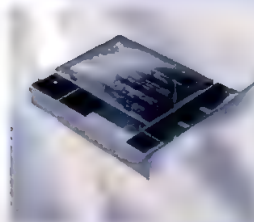


Microsoft
Windows 95

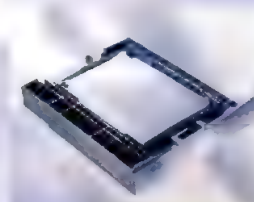
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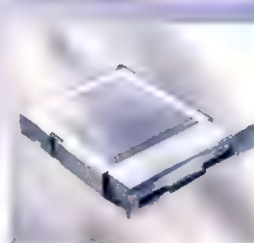
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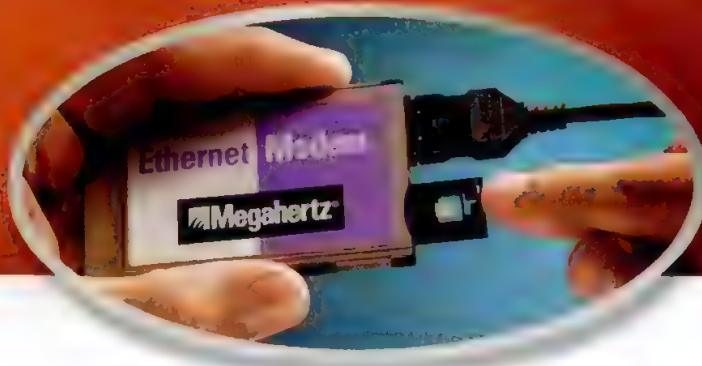
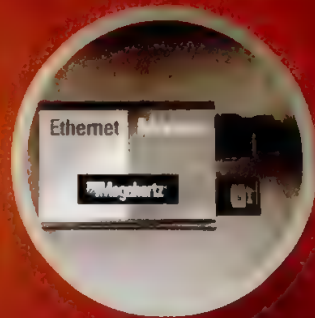
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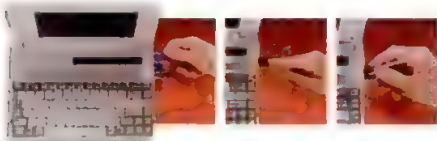


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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

NOTEBOOK PCs

IBM Stuffs a 14-Inch Color Monitor into Its ThinkPad 760CD's Super VGA Display

By Brian Nadel

IBM has once again staked out portable computing's high ground with the latest member of its vaunted ThinkPad notebook family. The \$7,948 ThinkPad 760CD sets new standards for notebooks in terms of screen size and resolution, CD-ROM integration, and video performance, making it the closest thing to a portable desktop PC available.

ThinkPad engineers have shoe-horned a wish list of advanced features into the 760CD's 8-pound-3-ounce travel weight: a quad-speed CD-ROM drive, a 12.1-inch active-matrix display, a 90-MHz Pentium processor, lithium ion batteries, infrared data transfer windows in the front and back, and a PCI data bus. This technological treasure trove fits into an 8.3- by 11.7-inch case that is one-tenth of an inch longer than that of the 755CD, yet is slightly thinner.

The first thing you'll notice about the 760CD is its enormous and brilliant active-matrix screen.

A product of Display Technologies Inc. (IBM's screen-making joint venture with Toshiba), the 12.1-inch Super VGA display is far and away the largest and best flat-panel display we've seen on a notebook. Able to display 800- by 600-pixel resolution, the screen can fit 56 percent more information than a standard 10.4-inch, 640- by 480-resolution panel. During evaluation, colors were uniformly rich and well saturated, regardless of whether the notebook

was configured to display 256 or 65,536 colors.

The screen's viewable area is indistinguishable from that of a 14-inch monitor. At first the effect can be startling. The display causes you to sit back to take the whole screen in, rather than lean forward to view the details, as is common with smaller screens.

The system's ability to display video accurately is nothing short of amazing. The 760CD has a 40-MHz RISC processor for decod-



MOVIE MACHINE: IBM's ThinkPad 760CD includes a quad-speed CD-ROM and MPEG support.

ing MPEG files. Audio is always synchronized and the video picture is always sharp, but it can

Continues on page 38

ELECTRONIC PUBLISHING

Common Ground: Full Font Fidelity, But Partial PostScript Compatibility

By Edward Mendelson

Common Ground 2.0 for Windows does much of what Adobe Acrobat does, but at a far lower cost in terms of dollars, memory, and disk space. Like Acrobat and Novell's Envoy, Common Ground generates transportable documents, which include all the text and graphics that you create in any Windows application but don't require the original application for viewing and printing on Windows or Macintosh systems. For \$189, Common Ground Software's Windows-based package includes all the utilities and drivers needed to generate, index, search, print, and distribute portable documents, though the feature that converts PostScript files to Common Ground's Digital Paper format lacks Acrobat's finesse.

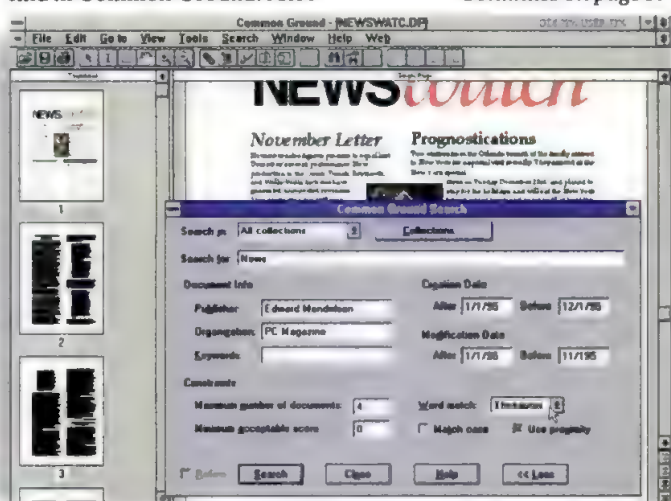
At \$195, Adobe's basic version of Acrobat (see First Looks, January 3, 1995) costs about the same as Common Ground, but you'll need to get the \$595 Acro-

bat Pro and the \$500 Adobe Acrobat Catalog to get the equivalent of Common Ground's array of features. Acrobat, however, is a more elegant and mature product and it comes with navigation and video features that you won't find in Common Ground. Acro-

bat has also spawned a small industry of add-ons and extensions, including Acrobat Capture, Adobe's splendid—but expensive—\$2,000 optical character recognition package (see First Looks, September 12, 1995). Acrobat documents, unlike those created by Common Ground, can be viewed on DOS and Unix systems in addition to Windows and Macintosh computers.

Common Ground uses Bitstream's TrueDoc technology to

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SEARCHING: Common Ground includes the complete Verity search and indexing engine for complex searches in multiple documents.

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First Looks

ThinkPad 760CD

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sometimes look a bit dark. In addition, .AVI video files look as good as they do on a desktop monitor, although motion can appear pixelated if scaled to full screen.

Video support would be nearly useless without a CD-ROM drive. The 760CD has a state-of-the-art quad-speed TEAC drive that can be hot-swapped for a floppy disk drive, an additional hard disk, or a second battery. In a rare design miscue, you need to use a special plastic bezel for the floppy disk drive, or connect it externally via an included cable. Occasionally when we swapped from the floppy disk drive to the CD-ROM drive, the system didn't recognize the new drive.

In the upper-left corner of the keyboard, there's a monochrome LCD screen that shows a group of status icons. These icons replace the antiquated LEDs used on previous ThinkPads. Though there is no icon to denote the CD-ROM drive, there are indicators for the floppy disk drive as well as numeric and graphic indicators for the amount of battery time left. The system still uses LEDs to show that the unit is charging or is in suspend mode.

IBM continues a tradition of excellent keyboards with the 760CD. The unit's TrackPoint III pointing stick sits among the G, H, and B keys; the B key has been delicately sculpted to provide better fingertip control of the pointing stick. But by far the most innovative aspect of the keyboard is that it tilts to a comfortable typing angle. Close the lid and the keyboard compresses; open the lid and the keyboard returns to its tilt. Other

notebook designs have fold-out legs that tilt the whole unit.

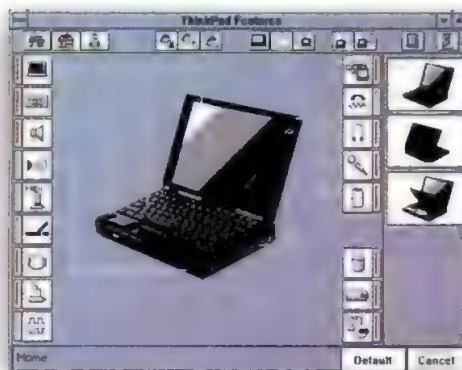
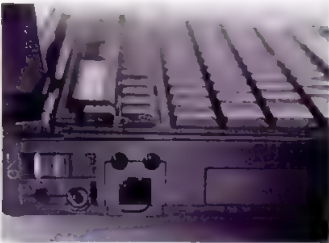
Although some notebooks sacrifice access, the 760CD gives access to the full desktop variety of ports. The 760CD retains the traditional mix of connectors (serial,

quality was good, but couldn't compete in terms of richness with the three-speaker system on Digital Equipment Corp.'s HighNote Ultra Multimedia Module.

The system we tested came with a 90-MHz Pentium processor



TILT-O-MATIC: To set up a comfortable tilt, the ThinkPad 760CD angles its keyboard.



CLICK AND SEE: The 760CD's Feature utility shows the notebook's functional details.

parallel, PS/2 mouse, and external SVGA) and adds those for video (NTSC video-in and video-out) and audio (microphone, MIDI, and external headphones). The 760CD's RJ-11 telephone jack is a welcome sight. Behind it is an Mwave digital signal processor that does double duty as a V.34 modem and a 16-bit audio system that is Sound Blaster Pro-compatible. There are also a pair of built-in speakers, a microphone, and a convenient slide volume control. Using the internal speakers, audio

(a 120-MHz model will be ready soon), a 1.2GB hard disk, and 16MB of RAM. On the whole, the system achieved good—though not stellar—performance results compared with the average of the nine full-featured P/90 notebooks in our issue of August 1995. The 760CD's fabulous DOS scores

and strong battery life (2 hours 28 minutes) have to be tempered by the unit's 102 showing on our Winstone 95 benchmark tests, which was about 10 percent off the mark. We feel that the absence of external cache on the 760CD held back its performance. The CD-ROM delivered data at 617 kilobytes per second, just above the rate of a quad-speed drive.

Even though the 760CD outlasted all comparable units in terms of battery power, it fell short when the CD was being used. During our

evaluation, the 760CD lasted for 1 hour and 50 minutes into a 2-hour-30-minute CD-based digital movie.

In addition to a dual-boot arrangement for Windows 3.1 or OS/2 Warp, the 760CD comes with a plethora of programs that extend the system's usefulness. Puma Technology's infrared file-transfer program is easily the best program of its kind. The unit also has a start-up interface for choosing whether you want the system configured for maximum conventional memory, for PC Card support, for DOS games, or for dial-in diagnostics via IBM's Online House Call program. The ThinkPad Features program shows a drawing of the system with icons that correspond to configuration details. It is the easiest way to change color depth, ports, and power-conservation settings, among other items. Finally, the system comes with a viewer for Philips CDi digital movies.

Though the 760CD has been thoughtfully designed, there are a few problems. During operation there is a barely audible high-pitched whine that could not be isolated. Also, though IBM's PC Card Director support for the unit's pair of Type II slots is adequate, it is clumsy compared with SystemSoft's more elegant and informative interface and deeper database of supported cards. Our experience was that using PC Director was a hit-or-miss proposition with a group of 12 assorted PC Cards.

Finally, the 760CD weighs in at 8 pounds 3 ounces with the CD-ROM drive in place; the floppy disk drive adds 13 ounces to the total. Though not excessive by today's standards for a notebook that does so much, it feels heavy and ungainly compared with today's notebook lightweights. A good start would be putting the 15-ounce power adapter on a diet.

With its groundbreaking color display, CD-ROM drive, and advanced video technology, the 760CD scores a hat trick for notebook users that may make the competition feel shut out.

ThinkPad 760CD. List price: With Pentium/90, 16MB RAM, 1.2GB hard disk, 12.1-inch active-matrix display, \$7,948. IBM Personal Computer Co., Somers, NY; 800-426-2968, 919-517-1950.

Circle 491 on reader service card

BENCHMARK TESTS



IBM ThinkPad 760CD

On the whole, the ThinkPad 760CD turned in good test results compared with the average scores of the nine full-featured P/90 notebooks tested for our issue of August 1995. The ThinkPad 760CD had excellent DOS scores and good battery life but a slightly subpar

Winstone 95 result. The absence of external cache on the ThinkPad 760CD held back its performance.

To measure the performance of the IBM ThinkPad 760CD, we used Winstone 95, Version 1.0; WinBench 95, Version 1.0; and PC Bench, Version 9.0. In addition, we used the WinDrain test to gauge battery life. The tested ThinkPad 760CD was equipped with 16MB of RAM

	Graphics		Disk	DOS-Mark	CPU-Mark ₁₆	DOS Video	DOS Disk	WinDrain (hours: minutes)
	Winstone 95	WinMark 95 (Mpixels/sec)						
IBM ThinkPad 760 CD	102	10.5	344	948	185	6,141	607	2:38
Average full-featured P/90 notebook (August 1995)	113	9.3	480	516	170	2,858	303	1:31

First Looks

Common Ground

Continued from page 37

guarantee font fidelity in its output without making you decide how the program should handle fonts. In fact, the program has no font options at all and transparently saves all the font data needed for accurate reproduction. By contrast, with Acrobat, you have to choose font-embedding options before creating a file if you want to guarantee that fonts will appear correctly on a remote system.

Like other electronic-document programs, Common Ground consists of two parts: a printer driver that "prints" Common Ground files to your hard disk from Windows applications and a viewer that displays

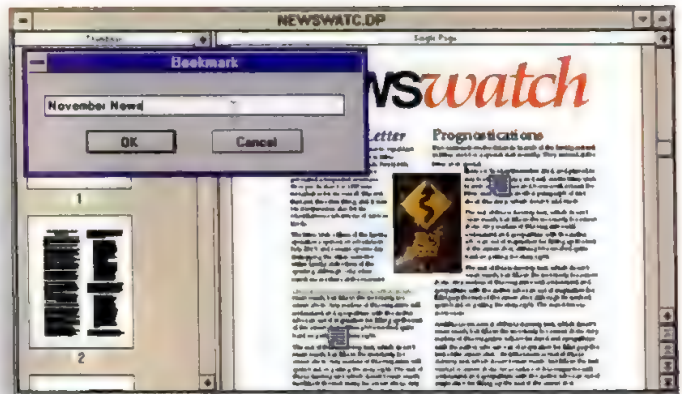
cessing document that Acrobat stores as a 140K file needs only 26K in Common Ground's format. Acrobat needed only 10 seconds to print that document to disk, while Common Ground took 15 seconds. But Acrobat doesn't create thumbnails on the fly while printing to disk—you have to create thumbnails as an option in the Acrobat viewer. When the time needed to create Acrobat's thumbnails is added in, the speed of the two products is virtually equal.

The Common Ground viewer comes in two different flavors. A 670K Pro viewer includes tools for adding, tables of contents, annotations, hyperlinks, and security features. A freely distributable 280K miniviewer just displays and prints files. Both viewers are far smaller than Acrobat's counterparts, and both, unlike Acrobat, can be attached to a file to create a self-opening document.

Both Common Ground viewers include an option to display anti-aliased fonts that are somewhat smoother-looking than normal screen fonts. The Pro viewer displays thumbnails and quickly creates hierarchical tables of contents, sticky-notes, highlighting, and other annotations that have been added to the file.

TANGLED WEB

The hyperlink feature builds links from one region of a file to another, but, unlike Acrobat, Common Ground won't build links between specific locations in two or more files. An undocumented workaround lets you exploit the cross-reference feature that normally creates links to Uniform Resource Locators (URLs) on the World-Wide Web, so that when you click on a link, the program opens your Web browser on that URL. To cross-reference another file on your disk, you simply enter a local path and filename in the URL field. But this procedure doesn't let you jump to a specific point in the target file, and the dialog boxes that support the URL feature are less helpful than the corresponding ones in Acrobat.



INSTANT RECALL: Common Ground supports bookmarks for tables of contents, hyperlinks (shown here in green), and sticky-notes (in blue).

Common Ground's viewer also lacks Acrobat's ability to define an "article" that leads a reader smoothly through preselected sections of a file; it also lacks Acrobat's support for playing video clips. Common Ground's keyboard shortcuts don't conform to Windows standards, so don't expect to use F3 to repeat a search.

You have to remember to use Ctrl-G instead.

A major advantage of Common Ground is its inclusion of the same Verity indexing engine that Adobe only offers in its \$500 add-on package, Acrobat Catalog. This program creates indexes for fast searching of whole groups of files. Although Adobe includes the Verity search engine in its basic Acrobat package so that you can search an existing indexed Acrobat .PDF file, you need Catalog to create an index. Common Ground comes with both the indexer and search engine.

TRUE-TO-LIFE POSTSCRIPT

Acrobat's obvious advantage is its understanding of Adobe PostScript. Common Ground uses the shareware GhostScript interpreter when you switch on PostScript support, but it's no match for Adobe PostScript.

When we printed a Quark XPress document consisting only of an Encapsulated PostScript image, the resulting Common Ground file occupied

313K of disk space, while the Acrobat file created by Acrobat Distiller took up 4K. The Common Ground file printed to an HP LaserJet 4 at about half the speed of the Acrobat file and produced specks, distortions, and other artifacts when displayed in the Common Ground viewer. When we tried printing

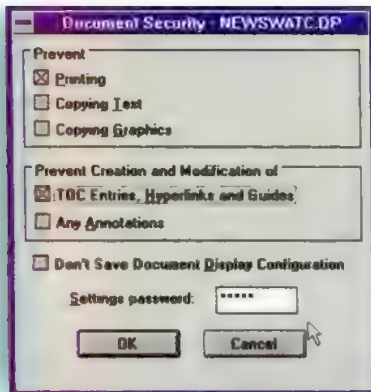
the same files to a PostScript printer, the Acrobat file printed quickly, but we stopped trying to print the Common Ground file after waiting 30 minutes for the page to emerge. The first few times we tried to use Common Ground's PostScript support, Windows crashed, but the program sorted itself out after being reinstalled.

Acrobat is the clear high-end standard for electronic publishing. But for documents that don't require PostScript-level graphics,

Common Ground 2.0 for Windows is an economical alternative that performs impressively and creates files that are compact enough to distribute quickly and easily.

Common Ground 2.0 for Windows. List price: \$189. Requires: 4MB RAM, 7MB hard disk space, Microsoft Windows 3.1 or later. Common Ground Software Inc., Redwood City, CA; 800-598-3821, 415-802-5800; fax, 415-593-6868.

Circle 490 on reader service card



SECURITY: Basic security options are available within Common Ground.

those files, complete with optional bookmarks, hyperlinks, sticky-notes, and thumbnails. This driver includes an option to process PostScript documents. You'll need this when working with Quark XPress and other applications that create their highest-quality output only in PostScript mode, and when working with files that contain Encapsulated PostScript and other high-quality graphic images. A separate module converts existing PostScript output files into Common Ground files.

Common Ground's claim to fame is the compact size of its documents. The program gives you the choice between proprietary lossless compression for graphics and various levels of JPEG compression. For example, a small but complex word pro-

First Looks Plus

From November 13 to November 17, go on-line to discuss Common Ground 2.0 with product manager Jay Saltzman and Edward Mendelson, a contributing editor at PC Magazine. Type GO EXEC from any CompuServe! prompt.

MACINTOSH SOFTWARE

SoftWindows 2.0 is No Speed Demon, But It Does Windows on a Mac

By Sebastian Rupley

Insignia Solutions' \$299 SoftWindows 2.0 effectively turns any Power Macintosh into two computers: One that operates in the traditional System 7.x operating system and one that runs the wide variety of Windows applications. SoftWindows opens up the full variety of Windows applications to Power Mac users, which will broaden the Power Mac's software identity. At the same time, Insignia's emulation technology still means a pronounced speed penalty compared with up-to-date PC hardware or Apple's 486-based DOS Compatibility hardware card.

Version 1.0 of SoftWindows was designed to emulate a 286 processor and was not stable enough for everyday use. This version of SoftWindows emulates a 486 processor instead and is as close to a bulletproof emulation program as we've seen. Unlike its predecessor, Version 2.0 can run Windows applications in Enhanced mode—a necessary requirement for modern Windows software. Of course, both Windows Standard mode and DOS programs run well on SoftWindows.

Though this release brings SoftWindows up to date in terms of compatibility, this release is not optimized to run Windows 95 applications. Insignia plans a Windows 95 upgrade early next year. In addition, Insignia will release a version of SoftWindows 2.0 for the wide variety of Unix workstations by the time you read this.

LONG AND WINDING ROAD

The wait for Version 2.0 of SoftWindows was long, mainly because of the complexity involved in emulating the 486 CPU's instruction set as opposed to that of the 286 CPU. For example, booting Windows in Enhanced mode requires 35 million instructions, compared with 5 million instructions in Standard mode. More sophisticated memory management and support for 32-

bit registers are other important key additions to SoftWindows 2.0.

The new SoftWindows is a complete PC software kit for Power Mac users. The package includes the entire code base for DOS 6.22, Windows 3.11, and the Windows Sound System. If you load SoftWindows, your Macintosh's sound system, microphone, and speakers are integrated.

The product is also network-friendly. SoftWindows ships with LAN Manager and NetWare 3.x

mance out of SoftWindows. Insignia says that 16MB of RAM are required, but we recommend at least 32MB, half of which should be devoted to Windows use. About the only parameter that can be adjusted is the size of SoftWindows' DeltaCache. This software buffer stores the most commonly used interpreted instructions in unused portions of the system's RAM. When these instructions are needed, they are already compiled and ready to be used.

SLOW BUT STEADY

Our performance results were underwhelming, to say the least. Compared with results on up-to-date PC hardware, our Power Mac 9500 running SoftWindows

Pentium/75 system, which is what we consider to be today's entry-level PC.

We also ran several Windows multimedia applications with SoftWindows and found them usable and compatible, if not as speedy as what we're used to with a PC. Notably, SoftWindows is scriptable, so users can automate Windows tasks to take place, say, in off-hours when performance isn't an issue.

One of the more intriguing aspects of using the program is that SoftWindows provides a common Clipboard that allows the sharing of information between Macintosh and Windows applications. For example, you can copy a bitmapped image from your Mac image-editing program and paste the image into your Windows word processing program, and then take the combination of words and images and move it into a desktop publishing program.

GETS THE JOB DONE

Anyone used to Windows applications running on Pentium-class hardware will find that performance drags. In the end, SoftWindows backs up Insignia's claim that it will get your work done.

For Power Mac users who only need occasional access to Windows applications for predefined tasks such as word processing and e-mail, the new SoftWindows is truly good news and an important boost for the Power Mac platform. At \$299, SoftWindows is far less expensive compared with buying a PC or Apple's \$600-\$700 DOS Compatibility Card.

For users with time-intensive Windows tasks to perform, SoftWindows' emulation is still distant competition to running Windows applications natively on a modern PC. For an occasional dip into Windows applications on the Power Mac platform, though, SoftWindows is an inexpensive, workable solution.

SoftWindows 2.0. List price: \$299. Requires: Power Macintosh system or PowerBook, 16MB RAM (32MB recommended), 33MB hard disk space, System 7.5. Insignia Solutions, Mountain View, CA; 415-335-7100; fax, 415-335-7105.

Circle 486 on reader service card

BENCHMARK TESTS



SoftWindows 2.0 On a Power Mac 9500/132

SoftWindows 2.0 was able to emulate Windows on a Power Mac 9500/132 at about the performance level of a 486 PC but far behind that of a Pentium PC. We experienced no compatibility problems.

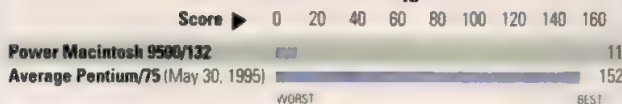
We used Winstone 95, Version 1.0, and PCMark, Version 9.0, to gauge the performance of

SoftWindows 2.0 running on a Power Mac 9500/132. The system was configured with 64MB of RAM and a 2GB hard disk. SoftWindows 2.0 was configured with a 2MB DeltaCache, 15MB of extended memory, 800-by-600 resolution, 256 colors, and a 20MB permanent Windows swap file.

WINSTONE 95



CPUMARK₁₆



clients. Banyan's VINES, Digital Equipment Corp.'s DEC Pathworks, TCP/IP software, and Windows for Workgroups are supported but not included in the box.

SoftWindows' performance is scalable, depending on what CPU you're running, but don't expect to be dazzled. For our benchmark tests, we used a high-end Power Mac 9500 that was powered by a 132-MHz PowerPC 604 processor. The configuration included 64MB of RAM and a 2GB hard disk.

Though this configuration may seem excessive, extra RAM and hard disk capacity are key elements in getting the most perfor-

was lethargic. This was acceptable in view of the fact that SoftWindows is mimicking the x86 instruction set in the Mac's PowerPC processor. SoftWindows did run Windows applications fast enough to work with them, but we frequently found ourselves wanting to walk away from the system for another cup of coffee.

On our Winstone 95 benchmark tests, which are based on 13 popular Windows applications, SoftWindows on the Power Mac 9500 posted an overall score of 20. This is what we'd expect from a midrange 486 PC, but well below the score of 111 for an average

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GRAPHICS

ClarisImpact: Jack of All Trades, Master of None

By David Haskin

ClarisImpact 2.0 for Windows is a unique product that combines the abilities of charting, drawing, presentation-graphics, and word processing programs into one \$129 package. Though not as powerful as applications dedicated to these specific tasks or the current crop of application suites, ClarisImpact excels at simplifying the creation of graphically varied documents.

ClarisImpact's drawing program has been designed for nonartists and in some cases resembles Visio in its ease of use. You select a type of illustration, such as an organization chart or flowchart, in a dialog box and then use other dialog boxes to select layout and formatting options.

To expand the chart, click on an existing shape and arrows appear on its perimeter. One more click on an arrow causes an identical shape to appear that is connected to the first. In addition to creating basic business drawings, you can click on icons to add calendars, data charts, tables, time lines, and text outlines.

Although Visio provides stencils for a greater variety of business drawings—such as maps and room layouts—ClarisImpact provides more flexibility with its built-in presentation-graphics and word processing modules. Although neither module will replace more focused products such as Microsoft PowerPoint or Word for Windows, each is invaluable for getting a chart's wording just right.

The word processor provides solid formatting capabilities but few power features. The presentation-graphics module includes a broad selection of templates, a slide sorter, and outline views but isn't useful for creating on-screen presentations. Specifically, while it supports transition effects between presentation slides, ClarisImpact doesn't perform multimedia tricks such as path animation for bullets and headings or provide the ability to add sound. The payoff for users is that ClarisImpact is so highly integrat-

ed that adding elements such as flowcharts and time lines to slides is easier than with products such as PowerPoint.

The new DataDraw feature uses data from other applications to create charts, tables, and time lines. A wizard-like series of dialog boxes assists you in customizing the presentation of your data. DataDraw, unfortunately, can only use tab- or comma-delimited text files and can't import common spreadsheet and database formats. Although it is a useful extension for the program,

DataDraw represents the extent of ClarisImpact's links to external data; the program has no support for either OLE or DDE.

ClarisImpact's unique ability to mix and match different types of graphics objects in several types of documents makes it a good all-in-one program for many users.

ClarisImpact 2.0 for Windows. List price: \$129. Requires: 4MB

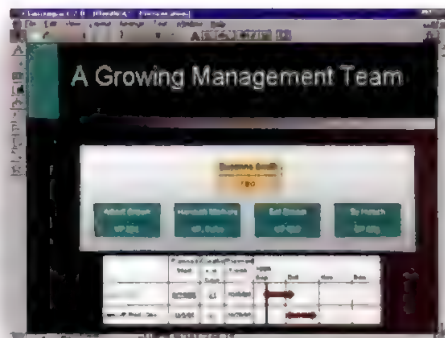


CHART ART: ClarisImpact 2.0 makes it easy to add graphics elements to different types of files.

RAM, 18MB hard disk space, Microsoft Windows 3.1 or later. Claris Corp., Santa Clara, CA; 800-544-8554, 408-727-8227.

Circle 401 on reader service card

CD-ROM AUTHORIZING

SimpliCD Lets You Record Your Own CD-ROMs Quickly

By John Garriss

Young Minds' SimpliCD Release 3 simplifies the process of recording CD-ROMs, whether they be for music or data. Although SimpliCD streamlines the cutting of a CD, the hardware and financial requirements are still prohibitive for most users.

Our \$4,895 test package included the \$285 SimpliCD software, an Adaptec SCSI adapter,

CD lets you record audio, data, or mixed-mode (audio and data) CDs. The program lets you toggle between audio and data views so that you can handle both standard audio tracks and data files.

SimpliCD provides two ways for you to record data to your CDs. The standard way uses a file called a track buffer. The program copies your selected files from their sources to a single file on your hard disk and then writes

ing the \$20 recordable media.

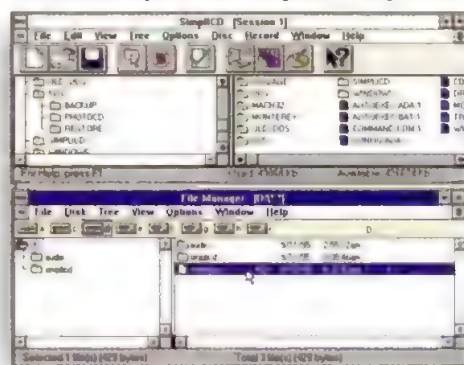
During installation, SimpliCD ran a set of performance tests on our computer to determine how fast the computer was capable of recording. SimpliCD judged our 486DX/33-based Compaq Deskpro to be suitable for double-speed recording, while our HP Vectra 5/90 Pentium was deemed safe for quad-speed recording.

SimpliCD also comes with a program called SimpliStor, which lets you perform basic backup and restore functions on the CD. SimpliStor can perform differential and incremental backups as well as basic copying and archiving. The program retains all the DOS-based attributes of your protected files. You can also use it to record a multi-session CD.

SimpliCD's combination of ease of use and advanced features makes it very appealing. Whether you're creating CD-ROMs or music CDs or just backing up your hard disk, SimpliCD can do the job quickly and easily.

SimpliCD Release 3. List price: \$285. Requires: 4MB RAM, 15MB hard disk space, Microsoft Windows 3.1 or later. Young Minds Inc., Redlands, CA; 800-964-4964, 909-335-1350; fax, 909-798-0488.

Circle 402 on reader service card



MAKE YOUR OWN CDs: SimpliCD's interface lets you drag and drop files directly onto a recorder.

and a Philips CD recorder.

SimpliCD's interface allows you to get started without knowing the intricate details of CD mastering. Just open the SimpliCD software in one window and File Manager in another, then drag and drop your files from File Manager into SimpliCD. Simpli-

the file to a track on the CD. After you select all your files and audio tracks, SimpliCD's preview feature lets you try out your CD.

New to this version is a faster method called formatting-on-the-fly, which lets you bypass the track-buffer file and transfer data directly to a CD. Although formatting-on-the-fly cuts recording time significantly, you need a computer fast enough to keep up with your CD recorder: Young Minds recommends a 486DX2/66 or better processor. If your hardware can't keep up with the recordable CD drive, you run the risk of destroy-

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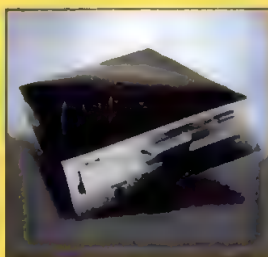
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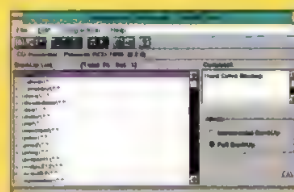
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*PC internal version

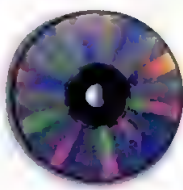


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GRAPHICS

ABC Graphics Suite 95: All-in-One Windows 95 Images

By J.W. Olsen

With the \$299.95 ABC Graphics Suite, Micrografx brings the first complete, integrated set of graphics tools to the Windows 95 environment. You'll find ample power and flexibility in the suite's four native Windows 95 components: ABC FlowCharter, Picture Publisher, Designer, and ABC Media Manager, a clip-art management utility. Graphics Suite also includes a copy of Micrografx's 16-bit SnapGraphics and a coupon for Visual Software's Instant 3D.

FlowCharter, Picture Publisher, and Designer each represent a full-version upgrade from their predecessors, with many new-and-improved features. Graphics Suite's Office 95 integration is notable for being one of the first non-Microsoft programs to be compatible with the Office 95 Binder, but not all elements are supported. You can drag-and-drop a Designer

saving disk space and enforcing consistency across documents.

In case you don't need the more esoteric features of Adobe PhotoShop, Picture Publisher remains the image-editing and painting tool of choice. Because of its multi-threading abilities, the program lets you work double-time: You can edit in the foreground while Graphics Suite opens multiple files.

The most interesting new aspect is Picture Publisher's support for the 32-bit Kodak Precision Color Management System, which brings Picture Publisher closer to true WYSIWYG color editing.

Support for the Internet's new GIF89a specification lets you generate transparent and interlaced .GIF files for your World-Wide Web home pages. Tools, commands, and macros can be added to a nearly unlimited variety of toolboxes for ready desktop access. Also welcome is Picture Publisher's unlimited undo and redo functionality.

In Graphic Suite's Designer component, illustrations and special effects, such as warping and autotracing, now are notably faster. Native support for PostScript EPS color separations and the Adobe color standard ease the movement of your artistic creations into desktop publishing programs such as PageMaker and Quark XPress. Designer

now supports more than 32,000 layers and, as with CorelDraw 6.0, placement precision is within one micron.

By integrating the DataAnalyzer module directly into FlowCharter, the program takes on a data-centric role with Graphics Suite. This incorporation allows real-time analysis of spreadsheet data that you can link to flowchart objects. The intuitiveness and convenience of DataAnalyzer is further enhanced by well-designed wizards.

The use of OLE 2.0 automation

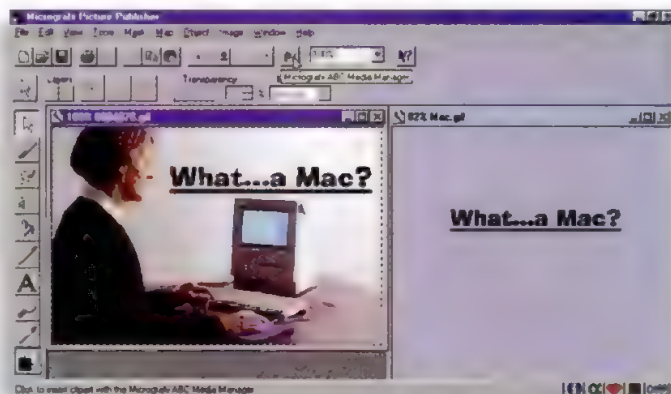
permits programmable integration with Access, Excel, and other apps via Visual Basic, Visual C++, and more than 400 OLE objects. Also, OLE 2.0 VBX triggers can be set to react to FlowCharter events.

You'll also appreciate Flow-

and rotate it, and overlay it with textures. A welcome quick-render mode previews effects in nearly real time.

At the other extreme is ABC's SnapGraphics, which is aimed at the artistically challenged who need to produce simple but professional-looking graphics.

Graphics Suite's 152-page guide briefly introduces the suite's modules and illustrates suite function-



CLICK-AND-DROP: Click on a Word 7.0 toolbar icon to invoke ABC Media Manager, then drag the image into Word.

Charter's 60 shape palettes and the more than 2,000 diagramming symbols that you can rotate for added versatility and design flexibility. Further, Media Manager clip art and photos can be imported into FlowCharter to serve as symbols within charts.

Media Manager—now accessible directly or via Excel and Word toolbar icons—catalogs images and displays thumbnails. It also offers keyword searching and imports and exports more than 35 popular file formats in a variety of ways. Among them, you can drag graphics files from the Windows 95 Explorer or drag-and-drop (or cut-and-paste) graphics from other Windows 95 apps.

Though you may have to wait for it, the inclusion of Visual Software's Instant 3D expands the definition of a graphics suite. We worked with a pre-release version and found that Instant 3D provides nearly unlimited 3-D creativity. The program lets you add 3-D effects to your text, place text on a path, bevel

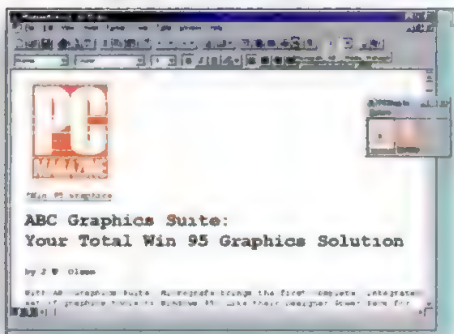
ality. The guide's 570-page companion resource book displays the package's remarkable quantity of clip art, fonts, and palette symbols. The suite's three CD-ROMs include more than 30,000 clip-art images, 7,500 photos, and 250 fonts.

There are two quirks to Graphics Suite. The program lacks a screen-capture utility. And unlike the other native Windows 95 components, FlowCharter doesn't support the Office 95 Binder.

If your goal is standardization on a complete Windows 95 graphics toolkit, ABC Graphics Suite 95 compellingly ties everything together with a pretty bow. You need to look no further.

ABC Graphics Suite 95. Estimated street price: \$299.95; upgrade, \$149.95. Requires: 8MB RAM (16MB recommended), 40MB hard disk space, Microsoft Windows 95 or Windows NT, CD-ROM drive. Micrografx, Richardson, TX; 800-676-3110; fax, 214-994-6477.

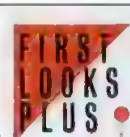
Circle 492 on reader service card



EASY WEB GRAPHICS: Picture Publisher saves .GIF files with a transparent background to add to your HTML document or to superimpose on another image.

or Picture Publisher image directly onto an Office 95 Binder compound-document file to add it as a new section.

As with Inset's HiJaak 95, graphics files are transparently converted as necessary when you drag them from Media Manager into any Windows 95 application. You can invoke Media Manager from icons that the suite automatically installs on Excel and Word toolbars. The suite's modules commendably use Office 95's default and customized dictionaries,



From November 6 to November 10, go on-line to discuss Micrografx's ABC Graphics Suite 95 with product manager Ingo Heel and reviewer J.W. Olsen. Type GO EXEC from any CompuServe! prompt.

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WIRELESS

Xircom Netwave: Wireless and Painless Networking

By Craig Ellison and
Jake Kirchner

If you've ever wanted to move about your building from meeting to meeting while keeping your notebook PC connected to your office network, Xircom's wireless Netwave system is a low-cost and reliable approach. Consisting of a \$399 Type II PC Card Xircom CreditCard Netwave Adapter and a \$1,499 Access Point base station, the system establishes a low-bandwidth radio link to your LAN by using 2.4-GHz spread-spectrum, frequency-hopping technology.

System setup was simple and straightforward. Although the Windows 95 driver is still pending Microsoft's certification, our tests indicate that the driver works. Insert the plug-and-play CreditCard adapter into your notebook's PC Card slot, and Windows 95 recognizes it as new hardware and prompts you for the driver disk.

To connect to the corporate network, you will need at least one Netwave Access Point. You link the Access Point to your 10Base-T or 10Base-2 network using standard connectors and plug in the power supply. That's it.

Xircom claims that an Access Point, in theory, has a range of 150 feet for indoor use and 750 feet for outdoor use. In practice, the working range is less due to physical obstructions.

In our test configuration at *PC Magazine's* editorial offices, we installed Access Points at the four corners of our one-floor, 40,000-square-foot office. We set the 5.5-by-8-by-1.75-inch (HWD) units about 6 feet off the ground. Reception was good to excellent in all rooms, with no dead spots. As we carried our notebook PC into areas covered by different Access Points, the connection switched automatically among them.

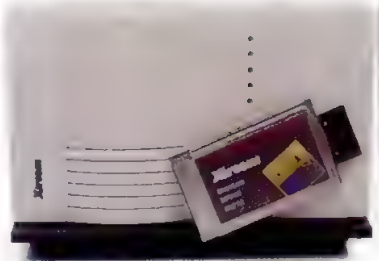
Xircom's site survey utility displays the signal strength of the link as you move. This is an excellent way to determine where to place the Access Points. For additional bandwidth in a specific location, such as a conference room, you

can install multiple access points. Each provides a 1-megabit-per-second channel, and load balancing among them is automatic.

If you have a small office without a server, Netwave can be configured to support peer-to-peer wireless networking among systems. The peer-to-peer network can use the Netwave CreditCard adapters if the systems are close enough together, or you can use Access Points to extend the range. Spread-spectrum technology is inherently pretty secure, but the Netwave software also includes an encryption option.

Though Netwave boosts throughput over early wireless efforts, users will notice slower network response than with a wired connection because Netwave's throughput is only about 40 kilobytes per second. At this speed you won't want to launch applications across the wireless link or download graphics files, but we were satisfied with Netwave's performance while accessing e-mail and browsing the World-Wide Web.

Xircom's Netwave is easy to install and easy to use, and we plan to make it a permanent part of our network.



WIRELESS NET: Xircom's Netwave establishes a spread-spectrum connection between notebooks and your LAN.

Xircom Netwave. List prices: Netwave Access Point for Ethernet, \$1,499; CreditCard Netwave Adapter, \$399. Xircom Inc., Thousand Oaks, CA; 800-438-4526, 805-376-9300; fax, 805-376-9311. Circle 406 on reader service card

ON-LINE UTILITIES

Rosebud Organizes CompuServe News, Weather, and Finances

By J.W. Olsen

Like PED Software Corp.'s Journalist, Magee Enterprises' \$69.95 Rosebud 1.0 makes quick work of retrieving, organizing, and analyzing the

lies in the interrelationship among the program's three separate modules: Assignment Desk, Collection Agent, and Viewer. In Assignment Desk you tell Rosebud what data to collect and how

ically called CompuServe hourly.

Rosebud's Viewer module lets you create individual data screens. For example, we set up a weather page containing current reports for Boston and Chicago and a national radar map.

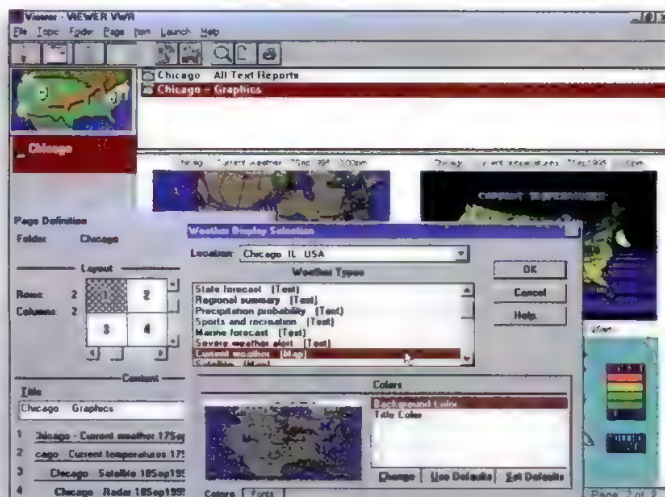
In addition, the e-mail functionality within Rosebud is surprisingly robust. Among its other features, the program can automatically forward selected reports to specified recipients.

Rosebud has some rough edges. Remnants of pop-up dialog boxes don't always disappear until you refresh the screen. Also, some Viewer screens can be hard to read. Lastly, merging the three modules into a single interface would make it easier to form Assignment Desk and Viewer relationships.

Rosebud makes the gathering and analysis of news, weather, and financial information a delight. At \$69.95, Rosebud 1.0 offers more power than the pricier \$129.95 Journalist, but you must put up with its pedestrian interface in order to get the most out of CompuServe's data potential.

Rosebud 1.0. Estimated street price: \$69.95. Requires: 4MB RAM, 12MB hard disk space, Microsoft Windows 3.1, modem, CompuServe account. Magee Enterprises, Norcross, GA; 800-662-4330, 404-446-6611; fax, 404-368-0719.

Circle 405 on reader service card



MIX AND MATCH: Rosebud's Viewer lets you design pages to display data relationships that you specify.

cornucopia of data available from CompuServe. Whereas Journalist's forte is a desktop publishing-style presentation, Rosebud's rather Spartan interface emphasizes its ability to create new data relationships.

The key to Rosebud's power

to collect it. We set the program up to gather hourly IBM Corp. stock price quotes, Monday through Friday for the remainder of the fiscal year, and notify us if the price drops below \$75. Rosebud's Collection Agent, which runs in the background, automat-

PORTABLE ACCESSORIES

AER PowerPro: The 10-Hour Notebook Battery

By Steve Buehler

AER's Energy PowerPro (\$399) is the first zinc-air battery available for laptops, and by combining cutting-edge technology with a clever design, the PowerPro offers users of certain Toshiba notebooks the promise of a full day of continuous computing.

Zinc-air battery technology, in which atmospheric oxygen is used to fuel the cell's electrolytic chemical reaction, is a natural fit for portable computers. Compared with today's conventional nickel hydride (NiMH) or lithium ion (Li-ion) batteries, Zinc-air cells can give notebook users more energy in the same weight and volume. That translates into longer running times.

The PowerPro, which at full charge holds 150 watt-hours of energy, is a 4-pound-15-ounce, 7/8-inch-high plastic slab that fits underneath a variety of Toshiba notebooks and connects to the system via the notebook's battery contacts. The battery is secured with the notebook's battery lock and a pair of Velcro straps in the back. Right now, the PowerPro works with the Toshiba Satellite T1900 series, Satellite Pro T2400 series, T4700C, T4800CT, or T4850CT notebook PCs, but AER promises a more extensive list of compatible notebooks in the future. The first extension will bring the PowerPro to HP's OmniBook 600.

A nice design touch is the 2.3-inch-wide wrist rest that extends from the front of the PowerPro platform. Though the right side of the wrist rest pivots out to allow access to the notebook's floppy disk drive, the cover is flimsy and could be easily broken.

The PowerPro was simple to set up and use and gave us 10.3 hours of uninterrupted rundown time with a Toshiba T1900 notebook. We used the PC Magazine Labs WinDrain battery test with the notebook's power conservation features turned off. The standard 1-pound-4-ounce Toshiba NiMH battery lasted just over 3 hours between charges on the same test.



ALL DAY LONG: The AER PowerPro gives you 10 hours of computing.

If you need the extended battery life of 10 hours to work your way across the Atlantic or Pacific

Ocean on a single charge, this may be a cheaper, lighter, and more convenient option than carrying a bag of extra batteries.

You'll have to pay the cost of long recharge cycles, however. The PowerPro requires about 2 hours of charging time per hour of usage—a major inconvenience, especially for travelers not near outlets for long periods.

Longevity is another crucial issue. AER claims a lifetime of 80

charge cycles if the battery is 25 percent depleted, but as few as 25 charge cycles if the battery is deeply discharged. Replacement battery cells are available from AER.

For the long-haul road warrior, the inconveniences of slightly more weight and size and some fan noise when running are minor. If you need real-world all-day battery life, this is your only choice.

AER Energy PowerPro. List price: \$399. Requires: Toshiba Satellite T1900 series, Satellite Pro T2400 series, T4700C, T4800CT, or T4850CT laptop PC. AER Energy Resources Inc., Smyrna, GA; 800-769-3720, 404-433-2127; fax, 404-433-2286.

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WINDOWS 95 CONTACT MANAGERS

Janna Contact 95 Can Organize Your Entire Business World—Slowly

By Nelson H. King

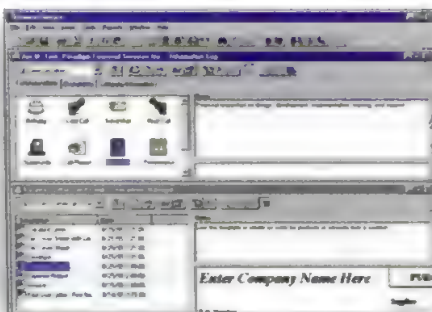
Jumping out of the starting gate with a native Windows 95 version, Janna Contact 95 is aggressively pursuing the 32-bit contact management market. The \$99 Contact 95 offers a unique blend of contact and document management that enables you to organize just about anything that resides on your PC—from word processing files to spreadsheets to graphics documents—but suffers from slow performance.

Contact 95 has embraced OLE 2.0 in a big way. The result is that you can drag-and-drop documents from the Windows desktop into Contact 95 documents, edit OLE documents without leaving Contact 95, or embed almost any kind of OLE object into your contact information.

In fact, Contact 95 is so open that you might take a while to start to use it as a universal organizer for all kinds of documents, not just those required by contact management. On the downside, the OLE connection moves so

slow that many may think the wait is not worthwhile.

A key part of the Contact 95 approach is how well the program melds with Microsoft Office 95 and Windows 95. This symbiosis has advantages: If you need to fax an open document, Contact 95 will send it directly through Windows 95. When you send e-mail, the message goes through the Inbox and Microsoft Mail, and you can do a mail-merge in Word



EVERY WHICH WAY: Information flows into Janna Contact 95 from a variety of programs.

for Windows. Contact 95 even shows enough confidence to provide direct synchronization of schedules with the Schedule+ component of Office 95.

Janna has made substantial improvements to the program's core contact management features as well. Most important is a new

database engine (the same one used by Microsoft Access), which adds both speed and sophistication to the behind-the-scenes data management. It has also enabled other improvements, such as unlimited addresses per contact and the ability to designate default customized fields based on the type of contact.

In addition, Contact 95's time management features have been completely redesigned. By combining the abilities of OLE and drag-and-drop and the more powerful database, Contact 95 allows greater flexibility for viewing and editing schedules.

Out of the box, Contact 95 is a network-ready multiuser product, and that capability has been improved with a group-based security scheme that allows users to belong to different groups, each with its own security assignment. Group scheduling has also been enhanced and now shows scheduling conflicts.

Janna Contact 95 has staked out the Office 95 turf early. If this is your environment of choice, then you'll find it a unique fit and a strong contact management program in its own right.

Janna Contact 95. List price: \$99. Requires: 8MB RAM (16MB recommended), 8MB hard disk space, Microsoft Windows 95 or Windows NT. Janna Systems Inc., Toronto, Ontario, Canada; 800-268-6107, 416-483-7711; fax, 416-483-3220.

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MBWARE

Business Insight Is Heavy on Marketing Savvy, Light on Communication Skills

By Craig Stinson

If you're considering using a consultant to prepare a marketing strategy, Business Resource Software's Business Insight 4.0 brings the expertise of marketing gurus Philip Kotler and Michael Porter to your desktop. Business Insight is an expert system that starts by querying you about every detail of your product or service, your company, your competition, and your market and then helps you formulate a customized strategy. At \$495, Business Insight is cheaper than a consulting fee and can pay dividends many times over.

The program uses separate segments for service and manufacturing companies. You begin your PC-based consultation by filling out an exhaustive—and exhausting—questionnaire that is organized into eight categories: enterprise information, product or product line, market definition, marketing and sales, competition, production, suppliers, and financials.

Most questions require a multiple-choice answer or the ranking of an assertion on a scale of 1 to 10, although a few sections ask for numerical input. Business Insight supplies its own spreadsheet program, which includes templates for standard calculations and accepts input from .WKS files.

Once you've established the basics of your business, Business Insight provides its analysis and recommendations in draft form via modules labeled Charts, Key Factors, Observations, Strategy Highlights, Strategy Lowlights, and Summary. This draft, which includes tables, charts, and text, can be exported to your word processor or edited in Business Insight's PlanWrite.

Like the questionnaire component, Business Insight's reporting modules are structured as outlines. From almost all nodes of the outline, tools are available to let you trace an output assertion back to the inputs on which the assertion is based. For example,

from the matrix chart titled Market Forces, you can click once to see the numerical values of the data point, or you can double-click to view the pertinent questionnaire section. This instant access can prove invaluable because it lets the user drill down to the microscopic level of a business plan and the plan's assumptions.

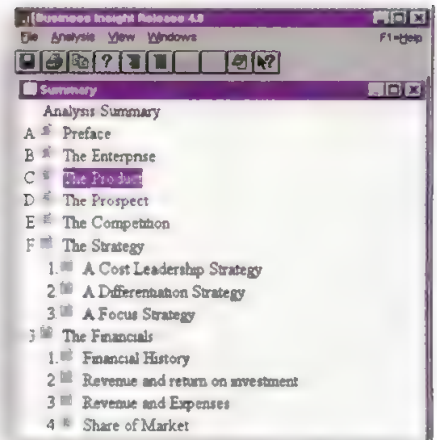
Business Insight lets you play what-if games with factors that affect the strength of your marketing strategy. For example, if the weightings used by Business Insight to arrive at a strategy seem inappropriate, you can adjust them.

Business Insight's weakest aspect is the quality of the prose it produces. The program's analyti-

cal commentary is marred by spelling and punctuation errors. Be ready to do some serious editing of the marketing statements. This weakness, although frustrating in a tool that relies so heavily on communications skills, is relatively inconsequential, however, given the program's analytical strength.

Despite its problems with English composition, Business Insight 4.0 is a valuable resource for anyone who is putting together a marketing plan.

Business Insight 4.0. List price:



EXPERT OUTLIER: Business Insight 4.0 makes extensive use of outlines to gather information and build your marketing strategy.

\$495. Requires: 4MB RAM, 2MB hard disk space, Microsoft Windows 3.1 or later. Business Resource Software Inc., Austin, TX; 800-423-1228; fax, 512-251-4401. Circle 488 on reader service card

CD SOFTWARE

CD-QuickShare: Faster, Cheaper Access to Networked CD-ROMs

By Barry Simon

Sometimes the most elegant ideas are simple ones. Stac has adapted its expertise in compression and virtual-drive technology to produce a virtual CD-ROM drive. The \$500 CD-QuickShare allows shareable CD images on hard disks, which can speed access and allow simultaneous use by several networked workstations.

Setup starts with loading QuickShare on the network administrator's system. Then the program automatically configures the LAN's workstations by modifying each PC's system files so that both the administrator and workstations load a driver and a copy of MSCDEX. To the operating system, this creates what looks like a CD-ROM drive.

In reality, this drive is pointing to a collection of compressed CD images on a networked hard disk. Our informal tests showed that



STACK OF DISKS: CD-QuickShare's interface lets you choose which CD-ROM image to access.

QuickShare posted a compression ratio of about 2:1 for text-based CDs and 4:3 for multimedia titles.

QuickShare lets you to configure up to five CD images and five users, and additional licenses for ten images and ten users cost \$135. With hard disk space approaching 25 cents per megabyte, this is an economical alternative

to a LAN-based CD tower. Hard disks are also an order of magnitude faster than CD drives and allow simultaneous access. QuickShare allows the administrator to specify the maximum number of users for a given CD.

Although the product is innovative and well designed and it performed well, it has several weak points. First, because QuickShare assigns a single drive letter for access to multiple titles, a user won't be able to load programs that use multiple CDs. There is no support for Red Book audio, and QuickShare relies on real-mode drivers, which require DOS memory. Finally, the user interface only lets you access CDs by choosing them manually; there is no way to automate loading of a CD.

These limitations are minor when balanced against the capability that CD-QuickShare gives you if you need to share multiple CDs across a network.

CD-QuickShare. Estimated street price: \$500 for five users and five CDs; \$135 for ten-user and ten-CD license. Requires: CD-ROM drive, Microsoft Windows 3.1 or later, Windows 95. Stac, San Diego, CA; 800-522-7822, 619-794-4300; fax, 619-794-3717.

Circle 489 on reader service card



BORN IN A BARN?

ACTUALLY, YES.



We share the vision of being our customers' only logical choice

1986

The Livestock Exchange Building cockroaches were this big.

March 1988
Phone system expanded to 10 lines!

1988
Earle Grueskin, our first former Sioux City mayor, joins the payroll.

February 1988

25 systems built and shipped in one day! All 10 phones ringing off the hook from Gateway's first major ad in *Computer Shopper*, "Computers From Iowa?"



1989

It doesn't get any better than this — standard VGA monitors on all PCs!

June 1989

Gateway goes online with GW2k BBS.

December 1989

McGraw-Hill purchases 386-20s and achieves immortality as Gateway's first major Fortune 500 customer.



January 15, 1990

Gateway moves digs in North Sioux City. 185 employees shipping 225 PCs.

February 1990

Ted thinks, "Gateway of big — better slogan." New logo and "Your friend in the livestock business" are introduced.



1987 Annual Sales: \$50.5 million Employees: 8 1988 Annual Sales: \$11.7 million Employees: 33 1989 Annual Sales: \$70.5 million Employees: 100

1987

Texas Instruments PC customers exchange TI PCs for Gateway 2000 IBM compatibles.

February 1987

Ted and Mike get sick of looking at each other. Up go the first cubicle walls!

1988

EGA color monitors standard on all systems.



1988

Ted hires high school kid (future Manufacturing Director) to spray paint Gateway logo on plain white boxes.

September 1988

Gateway herd finds greener pastures in Sergeant Bluff, Iowa (we moved there).



1990

The popular Sioux City whopping

October

Gateway system 1 value-priced at \$5,295

1987

Shipping clerk/sales rep can't pronounce "peripherals." So we focus on systems and ship our first 286 PC for \$2,295.

September 1988

Gateway sells 386-20 PC for \$2,995, receives *Byte* magazine's Award of Distinction.

You've got a friend in

At Gateway 2000, we always keep our sights on your future, giving you the latest computer technology. To take full advantage of Microsoft Windows 95, you'll need a PC specifically designed for this new operating system. So, we gave it our all and built every Gateway 2000 PC to optimally run Windows 95. Continuing a tradition of industry firsts, Gateway announces new keyboards, designed with Windows 95 in mind, and 100% Windows Plug and Play compatibility on all Gateway systems! Plus, every professional desktop also includes the new MS Office 95, Professional Edition software suite.

Microsoft Windows 95

All
Gateway
2000® PCs
include

Microsoft Windows 95 and are optimized to take full advantage of this new operating system. A 32-bit multitasking architecture gives you stellar performance, and a new graphic interface makes using your new operating system a breeze. You'll also be prepared for tomorrow's technology advances with Windows 95's 32-bit platform.

Gateway 2000 will provide Windows 95 toll-free technical support including installation, configuration and problem resolution assistance for the life of your computer!

100% Plug and Play Compatible!

That's right. Gateway 2000 is the first company with 100% Windows Plug and Play compatibility across the line. Every Gateway PC is now optimized with Plug and Play BIOS, peripherals, and operating system. Configuring and expanding your system is now easier than ever, because Plug and Play automatically recognizes and configures any new expansion hardware installed in your PC. Plug and Play will keep your computer up to speed as your needs change and technology increases.

New Gateway 104+ Keyboard!

It's another industry first! All Gateway desktop PCs include the new AnyKey+ or 104+ keyboard designed for your Windows 95 operating system. These keyboards include three new keys to work with Windows 95 — so you can easily switch between applications, launch programs and access files, and use shortcuts for the right-mouse button. As an added bonus, MS IntelliPoint and IntelliType software turn your mouse and keyboard into powerful, personalized computing tools. You'll love how the new AnyKey+ and 104+ keyboards and MS software complement the Windows 95 operating system.

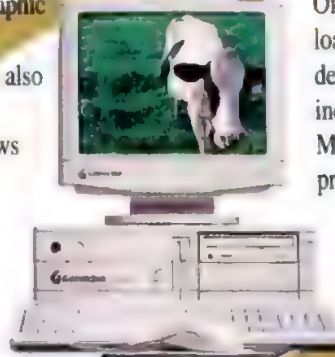
Optimized for Windows 95!

New Microsoft Office 95, Professional Edition

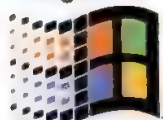
Another industry first. Microsoft Office 95, Professional Edition is pre-loaded on all Gateway professional desktop systems. This software suite includes the latest 32-bit versions of MS Word, Excel, PowerPoint® presentation graphics program and Schedule+, all on CD. Plus, you'll receive MS Access database and Bookshelf® 95 on CD upon release from Microsoft later this year (\$10 shipping charge).

Specifically designed to take advantage of the powerful 32-bit Windows 95 operating system, Office 95 is loaded with great new enhancements. The Office Shortcut Bar gives you one-click access to all five office applications, and Office Binder lets you keep documents from all applications in one place. Office 95 Professional upgrades on CD are available through Gateway's Component Add-on Sales for all Gateway customers with any version of MS Office or MS Works — for just \$264.

Call Gateway 2000 today and get Windows 95 optimized!



Designed for



Microsoft
Windows 95



8 0 0 - 8 4 6 - 4 5 1 6



pentium
PROCESSOR

The best place to buy a PC on the planet!



April 1993
Gateway named a Fortune 500 company and North Sioux City gets its first 4-way stop sign.



1993
Gateway offers first Family PC multimedia system for \$1,995.

March 1993
Gateway hires its 2000th employee.

April 1993
Gateway's one millionth PC ships to Jerry Herak in Spokane, Washington.

May 1993
Cow spots painted on Gateway's North Sioux City facility. Employees wonder what's next.

August 1993
The ColorBook and HandBook 486 enter Gateway's stellar product lineup.

May 1994
Gateway announces three-year warranty on desktop PCs and notebooks.

July 1, 1994
Gateway opens a showroom in Paris, France.

July 1994
CD-ROM drive on all Gateway PCs.

September 1994
OK, now it's in Japan and Germany and many other foreign languages.



1992: 1,300 Employees, 1992 Annual Sales: \$1.1 billion, 1993: 1,850 Employees, 1993 Annual Sales: \$1.7 billion, 1994: 2,200 Employees, 1994 Annual Sales: \$2.1 billion

2
support
line is
the first
company

October 1993
Gateway Europe sets up shop in Dublin, Ireland, marketing to Ireland and the UK.



File with our first computers, including HandBook, the first subnotebook.

1993
Gateway hires second former Sioux City mayor, Jim Wharton.

December 1993
Gateway becomes a public company.

November 1993
Another Gateway facility opens! This time in Sioux Falls, SD.



September 1993
Gateway introduces first VESA system.



October 1993
Gateway offers our first Pentium system, the P5-60, for \$3,595 and sweeps Computer Shopper's Best Buy awards for third consecutive year.

October 1994
North Sioux City welcomes the first "golden arches" of McDonalds.

November 1994
New Gateway facility opens in Kansas City.



December
The Li
notebo
its del

December
Gatew
"Feel



ounces a
arranty for all
nd monitors.



March 1995
Premier
issue of
GW2k:
Gateway
Magazine.

es standard
y systems

94
reland, France
. Ted considers
age lessons.

May 1995
Gateway's P5-120 is
named the "fastest PC
in the world," by
PC/Computing.

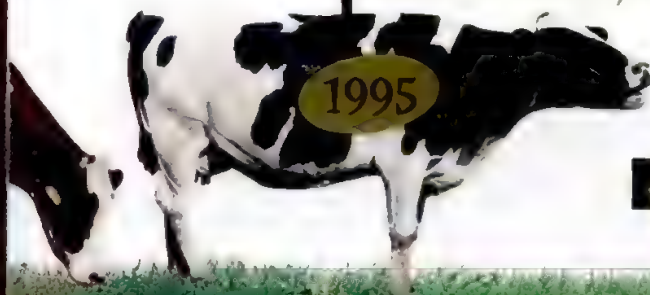


May 1995
Technical support completes
12,046 calls in one day! All
techs treated to sparkling cider
in plastic champagne glasses.

July 1995
Gateway ranks first among
Intel/Windows PC manu-
facturers in brand loyalty.

September 5, 1995
6,000 employees
worldwide cele-
brate Gateway's
10th Anniversary

September 6, 1995
Expansion must be
our middle name!
Plans announced
for Gateway Japan.



ees: 3,500 1994 Annual Sales: \$2.7 billion Employees: 4,500



ber 1994
berty small
book makes
out.

ber 1994
ay's Holiday ad insert,
Like A Kid Again" hits.

June 16, 1995
Gateway is first to offer
Windows 95 as a free
upgrade on all standard
configurations.

July 28, 1995
Gateway goes "down
under" to Australia.

August 1, 1995
Gateway Gold service
and support program
unveiled.

1996
North Sioux City
gets its first
traffic lights.



2015
Gateway continues its
dedication to bringing
all PC buyers the high-
est performance, tech-
nology and service —
all at the best value.

2020
"Hey Mike ... call me crazy,
but I think this whole computer
company idea is gonna fly."
Ted Waitt

We've always known our customers are the best. And now we have proof that Gateway 2000® has the most loyal customers in the entire Windows®-based PC industry!

Loyalty Unmatched

They've shown their allegiance by ranking us number one in brand loyalty in a new study from Computer Intelligence InfoCorp (CII). Among Windows PC manufacturers, Gateway 2000 ranked first in brand loyalty with an overall repurchase rate of 82%, 18 percentage points more than the nearest competitor! CII's annual Consumer Technology Index study is the largest, most comprehensive survey of PC usage in the U.S.

Why Gateway?

In 10 short years, Gateway 2000 has nurtured this customer loyalty by always keeping customer service and support our top priority. And by leading the industry in value and technology. We work hard to bring the right product to our

customers at the best prices along with performance unmatched by the competition.

Industry Firsts

Gateway 2000 has consistently brought PC buyers the very latest technology *before* the competition. Check out our timeline to see all Gateway's incredible industry firsts!

Unparalleled Service and Support

Our toll-free technical support representatives are fully trained to handle all your technical questions. Gateway's dedication to our customer doesn't end with the sale. We've

vowed to keep our cus-

Gateway Gold Service & Support

tomers the happiest PC users in the world. And now all Gateway 2000 PCs come standard with Gateway Gold!

Gateway Gold Service and Support

This new service and support program gives you all the support you need when you need it.



GATEWAY GOLD

- Toll-Free Technical Support 24 Hours A Day, 7 Days A Week
- Free Software Technical Support for all Gateway-provided operating systems & applications (Includes Windows® 95 Support)
- Industry-Leading Response Times For Toll-Free Support
- 1-Year On-Site Service Agreement*
- Next Business Day Response On-Site Service†
- Scheduled On-Site Service (2-hour appointment window)
- Extended On-Site Service Hours (6 a.m.-10 p.m. Monday-Friday, 8 a.m.-5 p.m. Saturdays)
- 3-Year Limited Warranty*
- Express Replacement Parts Delivery
- Club Gateway™ Membership
- GW2k™: Gateway Magazine—Gateway's quarterly publication
- Gateway Bulletin Board (BBS) Service
- Automated FaxBack Service

Be sure to ask about Gateway Gold Premium and A La Carte programs!

† Pending Parts Delivery

*Call or write us for a free copy of our on-site service agreement or three-year limited warranty.



"You've got a friend in the business."®

8 0 0 - 8 4 6 - 4 5 1 6



pentium
PROCESSOR



1991

Gateway becomes first company to win all four Computer Shopper Best Buy desktop awards.

February 1991

Gateway is first to introduce non-interlaced monitors on all systems.

April 1991

First cow-spotted boxes ship!



January 1991

Ted and Mike: "Will you sell us about a gazillion processors?" Intel: "Umm ... No."

April 1991

Gateway debuts new cool gray case design: mini desktop model and standard AnyKey keyboard.

February 1992
Customers rejoice! Gateway begins offering choice of application software with new systems at no extra charge



March 1991
Ted and Mike will you sell us about a gazillion processors? Intel:

1992
Barely a year ago, Gateway was already a PC M of the



Employees: 176

1990 Annual Sales: \$275.5 million Employees: 600

1991 Annual Sales: \$626.7 million Employees: 1,000

ation of North reaches a 2,019.

1990
y's first 486
its the market
iced at



May 1990

Microsoft Windows is now standard on all Gateway systems.

April 1991

Technical support completes a record number 2,800 calls in one day!

1991

Inc. magazine proclaims Gateway the fastest-growing company in the nation.

July 1992

Gateway pours first paved parking lot. Employees throw away hip waders.

March 1992
Technical support holding queue empty for the first time in company history.

May 1992
Going mobile: Gateway's portable computers are leading the hardware industry's



August 1991

Gateway's Robin Hood I ad hits.



the business.

It started as a dream, born on an Iowa farm. Today, 10 years later, the same company that once clocked in by a rooster crow is recognized as the nation's PC industry leader. The Gateway 2000® secret? Give PC buyers a quality product, the latest technology, and incomparable service — all at an unparalleled value. Our hard-working employees know what it takes to get the job done right. And we're ready to outdo ourselves in the next decade and beyond.

In an industry where change is the only constant, Gateway 2000 is proud of our loyal customers. How are we thanking them for 10 years of success? We asked our neighborhood Hallmark store, and they said, "10th anniversary gift? Why, traditionally that's tin!"

So, we threw that around for awhile, then

worked with our suppliers to bring you an incredible price on an extra-special, limited quantity computer: the system of systems, the granddaddy of them all...

Gateway's 10th Anniversary System

Introducing the Gateway 2000 10th Anniversary System! It's everything we're famous for: industry-leading product introductions, ultimate

performance and incomparable value! Designed with the computer connoisseur in mind, this limited edition, standard configuration comes in a new tower case with our 10th Anniversary insignia, housing a 133MHz Intel® Pentium® processor, the new Windows 95 operating system, 16MB EDO memory, and 17-inch Vivitron™ color monitor. And these industry firsts!

6X EIDE CD-ROM Drive

That's right! Gateway 2000 is the first to announce the new blazing 6X CD-ROM drive, standard on our 10th Anniversary System. It's the fastest EIDE CD-ROM anywhere. Combined with a Matrox® MGA WRAM graphics accelerator, you get 3-D graphics,

Designed for



Microsoft
Windows 95

The 10th Anniversary System



Sound 1.5-foot tower satellite speakers and a 40-watt subwoofer, give you high-fidelity stereo sound for all your multimedia applications and music CDs.

environment!
Two Altec™
Lansing
Surround

10th
Anniversary
Software
The
Anniversary
software bundle
includes
Microsoft Office

95, Professional Edition and Gateway's Generations Collection for over 56 of the most popular software applications pre-loaded on your hard drive. You won't find a more complete software package anywhere else!

And, for just \$49, we're offering yet another Anniversary software collection! You'll get Wing Commander® III, BioForge™, and more, along with Gateway's 10th Anniversary T-shirt.

Celebrate a decade of incredible PC values and order your Gateway 2000 10th Anniversary System today! Order any Gateway system and enjoy our commemorative 10th Anniversary mouse pad!

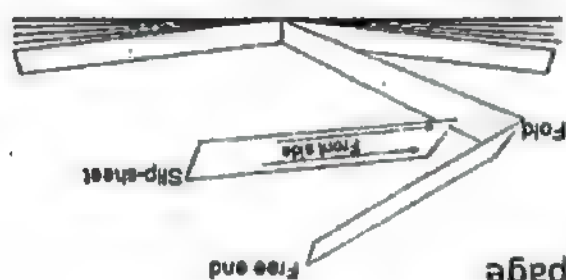


"You've got a friend in the business.™"

8 0 0 - 8 4 6 - 4 5 1 6

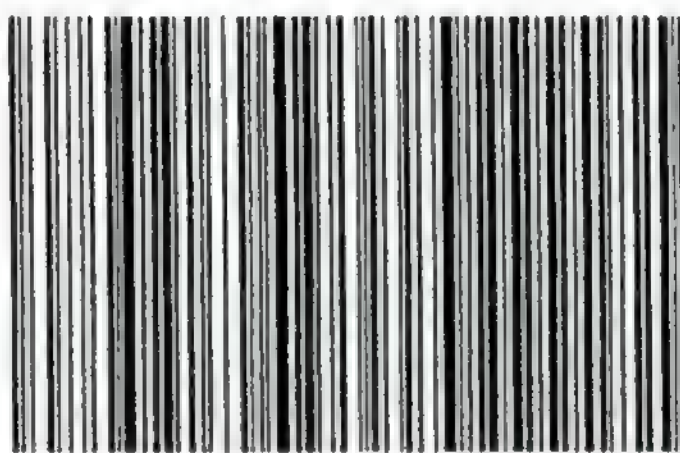


pentium
PROCESSOR



1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

Inverted Foldout slip-sheet

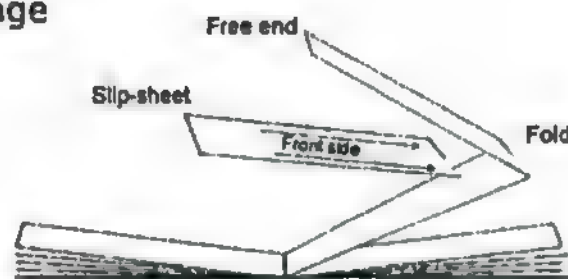


GbsSlipSheet-001

Folded edge of the page

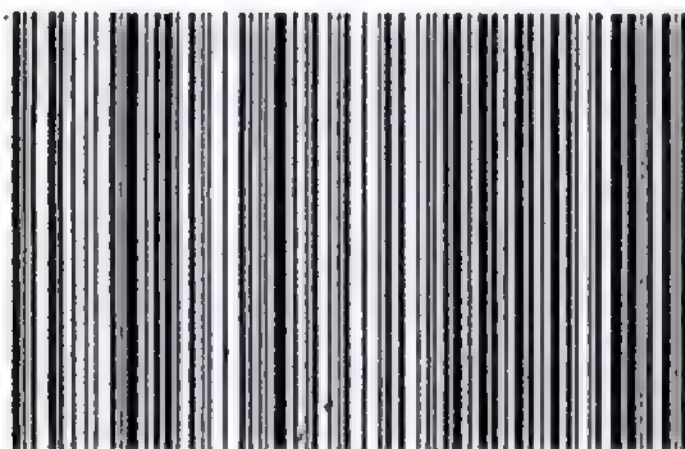
Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbs5lpBack-0018

Back

1. Follow instructions on the other side

We are Gateway 2000.



August 1985
"Hey, Mike ...
call me crazy
but I've had
this craving all
day to start a
computer
company!"
Ted Waitt

September 5, 1985
Congratulations, it's a computer
company! Gateway 2000 is born at
the Waitt Family Cattle Farm
outside Sioux City, Iowa.



August 1985
Ted's grandma, "Momo," takes
a leap of faith and becomes
Gateway's first principal investor,
securing a \$10,000 loan.



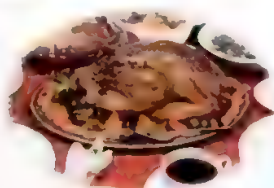
April 2, 1986
The Livestock Exchange
at the Sioux City Stock
Gateway's first home a
home.

April 3, 1986
UPS man gets stuck in e
tor for the first of many
Begins thinking of stair
alternative.



1985 Annual Sales: \$100,000 Employees: 2 1986 Annual Sales: \$1 million Employees: 4 1987 Annual Sales: \$1

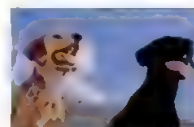
November 1985
Ted springs for
Thanksgiving
dinner for entire
Gateway
workforce (Mike
Hammond).



1986
North Sioux City,
South Dakota, gets a
water tower.



May 1986
Bunky & Jake fight a losing
battle for company mascot
honors. (The cow won.)



August 3, 1986
Shipping clerk covers for
Ted over lunch and
becomes Gateway's first
sales rep.

1986
Gateway 2000 ships its first PC.

We will always be happy, but we will never be satisfied.

Gateway 2000® Family PC™ Systems

P5 75 FAMILY PC

- Intel® 75MHz Pentium® Processor
- 8MB DRAM
- 850MB 10ms DMA Mode 1 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 32-Bit PCI Graphics Accelerator w/ 1MB DRAM
- 4X EIDE CD-ROM, 16-Bit Sound Card & Altec™ ACS-40 Speakers
- TelePath® 14.4 Fax/Modem Communication Center
- 3.5" Diskette Drive
- 15" .28dp CrystalScan® Monitor
- 7-Bay Desktop Case
- 104+ Keyboard & MS Mouse 2.0
- Microsoft® Windows® 95
- Generations Software Collection
- Gateway Gold™ Service & Support

\$1899

P5 100 FAMILY PC

- Intel 100MHz Pentium Processor
- 8MB EDO Performance-Enhanced Memory
- 1GB 9ms DMA Mode 2 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 64-Bit PCI Graphics Accelerator w/ 2MB DRAM
- 4X EIDE CD-ROM, 16-Bit Sound Card & Altec ACS-40 Speakers
- TelePath 28.8 Fax/Modem Communication Center
- 3.5" Diskette Drive
- 15" .26dp Vivitron™ Color Monitor
- 7-Bay Desktop Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- Generations Software Collection
- Gateway Gold Service & Support

\$2399

P5 120 FAMILY PC

- Intel 120MHz Pentium Processor
- 8MB EDO Performance-Enhanced Memory
- 256K Pipelined Burst Cache
- 1GB 9ms DMA Mode 2 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 64-Bit PCI Graphics Accelerator w/ 2MB DRAM
- 4X EIDE CD-ROM, 16-Bit Sound Card & Altec ACS-40 Speakers
- TelePath 28.8 Fax/Modem Communication Center
- 3.5" Diskette Drive
- 17" .28 CrystalScan® Color Monitor
- 7-Bay Desktop Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- Generations Software Collection
- Gateway Gold Service & Support

\$2899



■ Microsoft® Encarta® 95 • MS Bob™ • MS Money 3.0 • MS Works 3.0 • MS Publisher 2.0 • MS Publisher Design Pack • MS Cinemania® 95 • MS Bookshelf® 95 • MS Composer Collection: Beethoven, Mozart and Schubert • MS Wine • MS Arcade: Missile Command™, Asteroids, Tempest™, Centipede® and Battlezone™ • MS Dinosaurs • Mayo Clinic® Family Health Book • and Mayo Clinic Family Pharmacist • plus 31 popular MS entertainment games.

Gateway 2000 Manufacturing, North Sioux City, South Dakota, is ISO 9002 Certified.



Professional Systems

- Intel 75MHz Pentium Processor
- 8MB DRAM
- 850MB 10ms DMA Mode 1 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 32-Bit PCI Graphics Accelerator w/ 1MB DRAM
- 4X EIDE CD-ROM Drive
- 3.5" Diskette Drive
- 14" .28dp CrystalScan Color Monitor
- 7-Bay Desktop Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Works 95
- Gateway Gold Service & Support

\$1599

- Intel 100MHz Pentium Processor
- 8MB EDO Performance-Enhanced Memory
- 850MB 10ms DMA Mode 1 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 32-Bit PCI Graphics Accelerator w/ 1MB DRAM
- 4X EIDE CD-ROM Drive
- 3.5" Diskette Drive
- 15" .28dp CrystalScan Color Monitor
- 7-Bay Desktop Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition* with Bookshelf 95
- Gateway Gold Service & Support

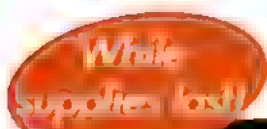
\$1999

- Intel 120MHz Pentium Processor
- 16MB EDO Performance-Enhanced Memory
- 256K Pipelined Burst Cache
- 1GB 9ms DMA Mode 2 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 32-Bit PCI Graphics Accelerator w/ 1MB DRAM
- 4X EIDE CD-ROM Drive
- 3.5" Diskette Drive
- 15" .28dp CrystalScan Color Monitor
- 7-Bay Desktop Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition* with Bookshelf 95
- Gateway Gold Service & Support

\$2699

- Intel 133MHz Pentium Processor
- 16MB EDO Performance-Enhanced Memory
- 256K Pipelined Burst Cache
- 1GB 9ms DMA Mode 2 EIDE Hard Drive
- PCI Enhanced IDE Interface
- 64-Bit PCI Graphics Accelerator w/ 2MB DRAM
- 4X EIDE CD-ROM Drive
- 3.5" Diskette Drive
- 15" .26dp Vivitron Color Monitor
- 9-Bay Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition* with Bookshelf 95
- Gateway Gold Service & Support

\$2999



10th ANNIVERSARY SYSTEM

- Intel 133MHz Pentium Processor
- 16MB EDO Performance-Enhanced Memory
- 256K Pipelined Burst Cache
- 1.62GB 9ms DMA Mode 2 EIDE Hard Drive
- PCI Enhanced IDE Interface
- Matrox® MGA™ Millennium™ 2MB WRAM Graphics Accelerator
- 6X EIDE CD-ROM Drive
- 16-Bit Ensoniq® Wavetable Sound Card
- Altec Lansing Surround Sound Speakers w/ Subwoofer
- TelePath 28.8 Fax/Modem Communication Center
- 3.5" Diskette Drive
- 17" .26dp Vivitron Color Monitor
- 9-Bay 10th Anniversary Tower Case
- AnyKey® Keyboard
- MS Mouse 2.0
- MS Windows 95
- 10th Anniversary System Software Collection: MS Office 95, Professional Edition* with Bookshelf 95 and Generations.
- Gateway Gold Premium Service

\$3999

Service When You Need It

- Toll-Free Technical Support 24 Hours A Day, 7 Days A Week
- Free Software Technical Support for all Gateway-provided operating systems & applications (includes Windows 95 Support)
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AST's Bravo Packs Pentium Punch with Cyrix 5x86 CPU

By Tin Albano

What's inside your PC? According to market surveys, probably an Intel processor, and if you're lucky, a Pentium. But if Cyrix is successful, you may have more CPU choices. In 75-MHz form, Cyrix's new 5x86 chip makes its debut on AST Research's \$2,064 (estimated street price) Bravo LC P/75. The results of our tests indicate that systems built around the Cyrix CPU can hold their own against units equipped with a 75-MHz Pentium processor. If the price is right, Cyrix may pose a legitimate threat to Intel's entry-level-PC dominion.

Cyrix designed the 5x86—which was originally called the M1sc—specifically to compete in this arena, where performance is often

a second priority to price. The company's M1 chip, which is due out later this year, is set to tackle even faster Pentium competition.

MIX OF OLD AND NEW

On paper, the 5x86 is a hybrid between 486- and Pentium-processor designs. To reduce cost, the 5x86 uses a 486 pinout pattern and works with existing 486-based motherboards with only a BIOS change. In addition to AST, several other PC vendors have plans to roll out 5x86-based systems by year-end.

The 5x86 runs at a clock speed of 75 or 100 MHz and has 1.9 million transistors (about half the number that the Pentium processor has). In addition, the 5x86 has a floating-point unit, 16K of unified write-burst L1



CYRIX INSIDE:

The Bravo LC runs Cyrix's new 75-MHz 5x86 processor.

cache, and one pipeline (a Pentium has two pipelines and one FPU). The chip's single pipeline reduces the complexity of its data path, allows a reduced die size of 144 by 144 millimeters, and opens up the possibility of much higher clock speeds in the future. This 3.3-volt chip will also be good for notebooks (see

the sidebar "Kiwi OpenNote: Picking Portable Fruit").

Some of the 5x86's more advanced features include its sophisticated branch-prediction model. The 5x86 has 128 entry branch-target buffers, compared with the Pentium's 256, but, unlike the Pentium, the 5x86 has an 8-entry return stack. The 5x86 splits out the cache access into a separate stage prior to instruction execution, which can produce a faster execution stage and improved pipeline sequencing with little additional penalty for mispredicted branches.

FIRST OUT OF THE GATE

An advanced processor alone does not a PC make, and AST is the first to market with a Cyrix 5x86-based system. The Bravo LC we tested came to PC Labs with a 75-MHz 5x86 CPU, 16MB of RAM, 256K of external cache, and an 813MB hard disk. We found no compatibility problems with the new CPU, and to the user, it is the equivalent of a comparable Intel processor.

The Bravo LC produced reasonable though not spectacular results over a variety of performance tests. The system's scores on our Winstone 95 benchmark tests (106) and our Graphics WinMark 95 tests (8.6 million pixels per second) were both slightly below the average results for a 75-MHz Pentium PC (111 and 10.2, respectively). For comparison, we also tested a Cyrix reference platform that used a 5x86 chip running at 100 MHz. This system achieved a Winstone 95 score of 126, which places its performance closer to that of a 90-MHz Pentium system.

But the Bravo LC wasn't built for speed. AST doesn't plan to sell this unit through retail outlets, opting instead to aim the unit at corporate customers. Given the Bravo LC's estimated selling price of \$2,064, which includes 16MB of RAM and a 14-inch monitor but doesn't include a CD-ROM drive, it can't really compete with other vendors' Pentium/75 PCs that sell for several hundred dollars less.

Kiwi's OpenNote: Picking Portable Fruit

With an appearance reminiscent of AT&T's breakthrough Safari notebook line, Kiwi's OpenNote combines an attractive design with a 7-pound travel weight and a wide assortment of high-end features at a reasonable price.

Kiwi's \$2,900 OpenNote goes against the grain in more areas than its Cyrix 75-MHz 5x86 CPU. Unlike all but a handful of notebooks, the OpenNote has an internal modem. Its maximum data transmission speed of 14.4 kilobits per second, however, will likely disappoint many.

The OpenNote has a single Type II PC Card slot, as opposed to the industry-standard pair of Type II slots that can also take a Type III card. The lone slot on the OpenNote will likely be used to plug in the external CD-ROM drive. This double-speed drive connects easily, works well, and displays video clips with reasonable fidelity, even on the OpenNote's 10.4-inch dual-scan color display. The drive's dimensions of 1.8 by 5.8 by 9.4 inches (HWD) will likely convince most to leave it behind.

Depending on how you feel about touchpads, you'll either love or hate the Synaptics pad on

the OpenNote. The pad is generously sized, the actuation buttons are well placed, and the included drivers let you adapt the pad to your needs and personal tastes.

The OpenNote's Winstone 95 and DOSMark scores trailed those of the average 75-MHz Pentium notebook. The poorer performance is likely the result of the 75-MHz 5x86's lack of external processor cache and EDO memory, both of which boost performance. While we were able to get 1 hour 42 minutes of battery life without the CD-ROM drive, connecting the CD-ROM drive lowered the amount of time between charges to about an hour.

At 1.8 by 11 by 8.5 inches, the OpenNote is smaller and much less expensive than the IBM ThinkPad 755CD but can't match the IBM's screen, integrated CD-ROM drive, and level of performance.—Brian Nadel

OpenNote. List price: With Cyrix 75-MHz 5x86 CPU, 16MB RAM, 527MB hard disk, 10.4-inch dual-scan color display, \$2,900. Kiwi Computer Inc., Santa Clara, CA; 408-492-9188; fax, 408-492-9187.

Circle 436 on reader service card



RIPE FRUIT: Kiwi's OpenNote is a notebook value leader that uses the Cyrix 5x86 processor.

First Looks

Where the Bravo LC does make sense is in the mainstream corporate environment, where speed isn't of the essence. Both the Cyrix 5x86 CPU and the Bravo LC built around it should prove to be reliable and reasonably priced.

Bravo LC P/75. Estimated street price: With Cyrix 75-MHz 5x86 CPU, 256K external cache, 16MB RAM, 813MB hard disk, 14-inch monitor, \$2,064. AST Research Inc., Irvine, CA; 800-876-4278, 714-727-4141; fax, 714-727-9355. Circle 437 on reader service card

BENCHMARK TESTS



Cyrix 5x86 Systems

Both the AST Bravo LC P/75, a desktop PC, and the Kiwi OpenNote, a notebook PC, scored acceptably well on all our tests but fell short of the mark set by the average 75-MHz Pentium desktop and notebook systems.

To gauge the performance of these systems, we used Winstone 95, Version 1.0; WinBench 95, Version 1.0; PC Bench, Version 9.0; and the WinDrain test of battery life. Each system was equipped with 16MB of RAM and used Windows 3.11. The Bravo LC had 256K of external cache, and the OpenNote had no external cache.

Higher scores represent better performance.	Winstone 95	Graphics WinMark 95 (Mpixels/sec)	DOSMark	CPUMark _{II}	DOS Video	DOS Disk	WinDrain (hours: minutes)
AST Bravo LC P/75	106	8.6	695	106	3,926	619	N/A
Average Pentium/75 desktop (May 30, 1995)	111	10.2	792	154	3,774	555	N/A
Kiwi OpenNote	59	1.7	536	89	1,843	528	1:42
Average Pentium/75 notebook (August, 1995)	92	6.8	595	157	2,686	389	2:00

N/A—Not applicable. A desktop PC does not rely primarily on battery power.

MUSIC SOFTWARE

Studio 4.0 Brings MIDI to Windows 95

By William Dyszel

With the release of its \$199 Studio 4.0, Midisoft Corp. is the first vendor to offer MIDI music software that takes full advantage of Windows 95 and Windows NT. Like Midisoft's earlier products, Studio 4.0 is

with standard MIDI events and maintain perfect synchronization between the two. The program plays .WAV files on a separate track, which runs parallel to the MIDI music tracks. The 16-bit Windows 3.1 version of the program supports one .WAV audio track, while the 32-bit Windows 95 and Windows NT version allows two concurrent .WAV tracks with separate volume controls.

Multithreading within Windows 95 and Windows NT allows all of these multimedia events to go on at the same time

without letting any of them interfere with one another. The dialog box that is used to insert a .WAV file into a score allows you to fine-tune the cueing of the sound to within 1/100th of a beat. After we finished using Studio 4.0 to compose music, we found that the program was just as useful for the detailed control of audio events required for the creation of a complicated multimedia presentation.

The music-recording and -notation abilities in the Windows 95 version include support for up to 384 independent MIDI tracks. These tracks can be recorded one at a time or in real time. You can enter musical notes with your

mouse or dictate them in real time with an external MIDI instrument. For example, you could play the notes on an electronic piano keyboard.

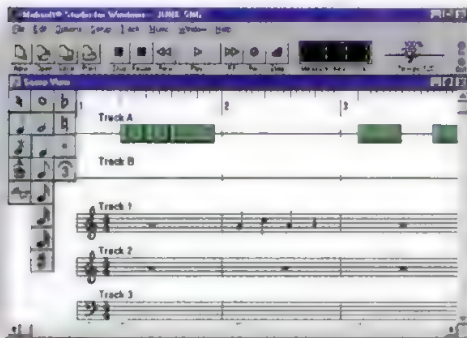
EASY CLEANUP

The errors that often occur in real-time recording from a MIDI keyboard often happen as a result of the extreme literalness and accuracy of the system. We found it easy to remedy this by splice-cutting and splice-pasting commands in Studio 4.0. Step-time entry requires you to use your mouse to dictate note values, and you can use your MIDI keyboard to enter pitches.

at a time.

In case you don't read music, you can also view music in piano roll format, where each note is represented by a bar whose height represents pitch and whose length indicates duration.

The use of multithreading in the service of multimedia events of differing types in Midisoft Studio 4.0 gives a hint of what's to come as we move closer and closer toward a 32-bit computing world. The list price of \$199, or the upgrade price of \$99 for current Midisoft Studio owners, keeps the product in an attractive price range for multimedia hobbyists.



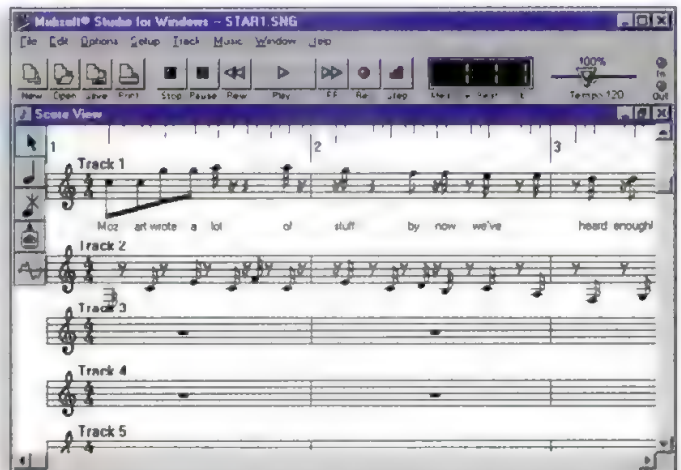
PERFECT PITCH: Midisoft Studio 4.0's interface tracks a score's notes.

aimed at the home musical enthusiast rather than the professional musician.

The program has a simple interface that's as easy as possible to understand and avoids the complex, high-end features needed only by serious musicians. Those who purchase Studio 4.0 will receive two versions: a 16-bit version for Microsoft Windows 3.1 and a 32-bit version for Windows 95 that works just as well for those using Windows NT.

IN PERFECT SYNC

Studio 4.0's most impressive new feature is its ability to incorporate .WAV files into a musical score



WORDS AND NOTES: Studio 4.0 lets you link lyrics and music together.

In addition, Studio 4.0 can link music to words, making just about anyone an instant songsmith. Lyrics can be added to any music staff and each note can be linked to its corresponding syllable in the score, although the program doesn't allow you to enter more than one line of verse

Midisoft Studio 4.0 for Windows 95. List price: \$199; upgrade, \$99. Requires: 8MB RAM, 5MB hard disk space, Microsoft Windows 3.1 or later, Windows 95, or Windows NT. Midisoft Corp., Issaquah, WA; 800-776-6434, 206-391-3610.

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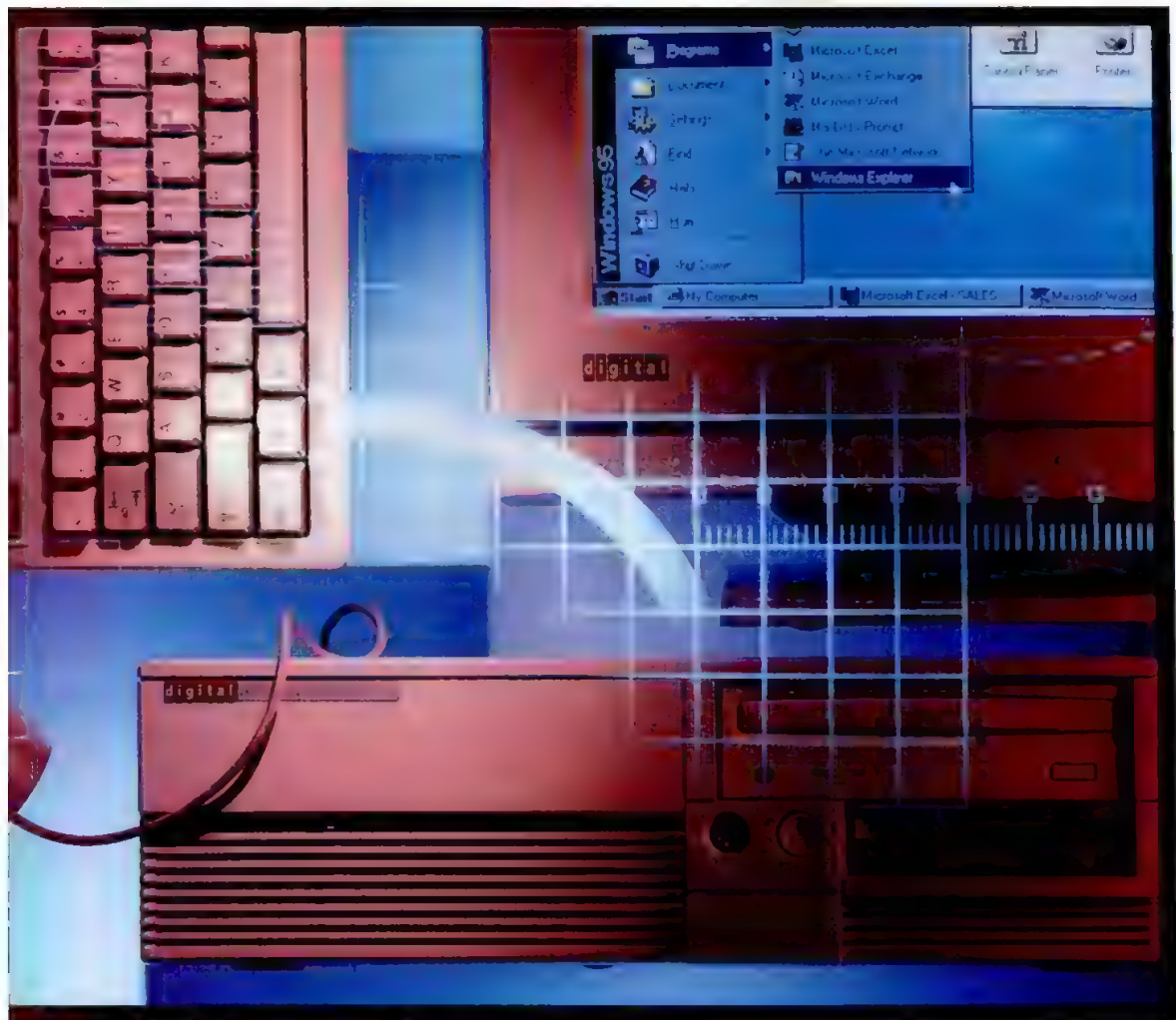


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MAPPING

Map Your Life with Compton's Complete Street Guide

By Bruce Brown

You don't need big bucks and a graduate degree in geocode programming to make and use digital maps, thanks to Compton's New Media's \$29.95 Compton's Complete Street Guide. Although it's not a tool for power mappers, this program makes it easy to create and customize maps.

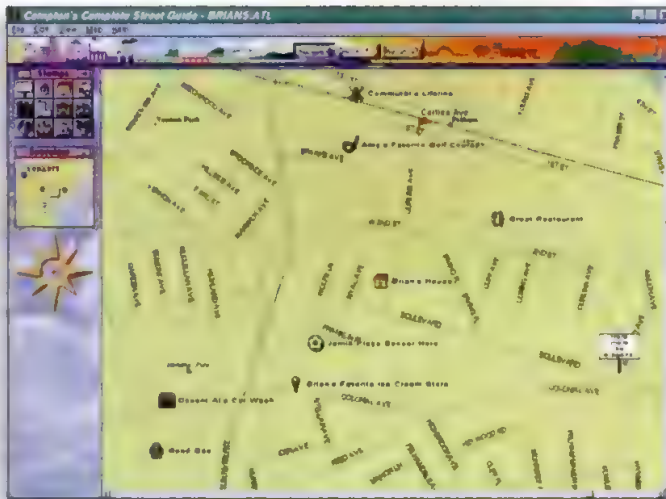
Installation from the program's single CD-ROM disk was simple and quick. Making an attractive and informative map to, for instance, give directions to parties, for car pools, and for executives visiting from out-of-state takes just a few minutes.

The Complete Street Guide opens with a view of the entire United States. You place the cursor on the region of interest and click to zoom in for more detail. Alternatively, you can use the Find function to enter ZIP codes as well as the names of states, counties, cities, and streets. The program places a red flag at the start of the street you've chosen.

Once you have the map you want, you can save or print it. But the power of the Complete Street Guide is the program's ability to customize a map with landmarks. The program includes 17 categories of landmarks, such as schools, churches, utilities, and prisons. You can add all the landmarks in a category for the area or select them individually. This is helpful, for example, for showing the school that is around the corner from your office.

In addition, the Complete Street Guide has 102 graphics called stamps that represent houses, building types, street signs, sports facilities, store types, and other helpful items that can be dragged and dropped in place. If you want to create a map showing a point-to-point route, a highlight feature lets you put a cross-hatched path between points.

There is no "best route" finder, so you'll have to highlight each leg of the route individually, and because the highlighter snaps



MAPMAKER: Compton's Complete Street Guide lets you add customized personal details to area street maps.

straight lines between points, you must be mindful of curves. After the route is in place, you can use

the stamps to add information and hints.

With the Complete Street

COLOR SCANNERS

ViewScan Color 16M: A Handy Scanner

By Rick Broida

If you need digital color images but can't afford a flatbed scanner, consider Ultima International's ViewScan Color 16M. For \$149, the ViewScan delivers 24-bit color images at resolutions up to 1,600 dots per inch and fits comfortably in the palm of your hand.

Installing the scanner is as easy as using it. The ViewScan plugs into an included proprietary 16-bit interface card, or you can use an optional \$49 parallel port adapter.

ViewScan's unique Missing Line Compensation (MLC) technology all but eliminates the headaches traditionally associated with hand-held scanners. MLC assembles scans of different portions of the same page and automatically compensates for scanning-speed disparities by correcting distortion and restoring lost scan-lines. Images that appear skewed or squished in the Twain driver's preview quickly snap to correct proportions. Even when we intentionally sped the scanner over an image, the driver did an admirable

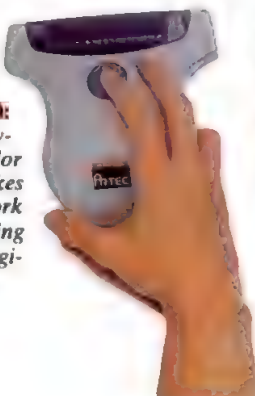
job of correcting the distortion.

Our other tests produced good overall scans. Colors occasionally appeared slightly washed out and text sometimes seemed blurry in 24-bit mode, but gray-scale and line-art scans were uniformly excellent. There was minor image degradation on the extreme right edge of every scan, however.

The ViewScan's Twain driver is refreshingly simple, if a bit on the rudimentary side. There are no controls for brightness and color saturation, so you must perform those tasks in an image-editing program. The driver provides three types of image-stitching: auto-, semiauto-, and manual.

SCAN-IN-THE-HAND:

The ViewScan Color 16M makes quick work of scanning color originals.



Guide's ease of use come some trade-offs. You can't locate addresses by street number, nor can you use geocoded data sets or link with a Global Positioning Satellite (GPS) locator. In addition, zooming granularity is limited to fixed maps of 1, 3, 6, 10, 70, 250, 650, 1,500, 2,300, and 4,000 miles; you can't change the screen size dynamically or specify the zoom size.

Compton's Complete Street Guide is a friendly mapping bargain good for business as well as home and family purposes. At \$29.95, it's a bargain, and until June 1996 it's even more of a value since the company is bundling a copy of the AAA Trip Planner CD-ROM.

Compton's Complete Street Guide. List price: \$29.95. Requires: 4MB RAM (8MB recommended), 4MB hard disk space, CD-ROM drive, Microsoft Windows 3.1 or later. Compton's New Media, Carlsbad, CA; 800-261-6109; fax, 619-929-2511.

Circle 439 on reader service card

Auto-stitching can't stitch together more than two pieces at a time.

The ViewScan comes bundled with a full complement of image-editing and optical character recognition (OCR) software. Ultima's PhotoStacker provides a comprehensive set of image processing tools, including OLE 2.0 support and an impressive array of special-effects filters, while occupying just 4MB of hard disk space. Recognita's OCR program, Go-CR, produced garbled text from the clearest of documents and uses its own driver, so you lose ViewScan's auto-stitching abilities, making recognition of a full page of text virtually impossible. Also, on several occasions Go-CR caused the scanner to stop working altogether.

The color-scanning abilities of the ViewScan Color 16M give hand-held scanners a new lease on life. At \$149, it's also a bargain. **ViewScan Color 16M.** List price: \$149. Requires: 4MB RAM, available 16-bit expansion slot, 10MB hard disk space, Microsoft Windows 3.1 or later. Ultima International, Fremont, CA; 510-440-1200; fax, 510-440-1216.

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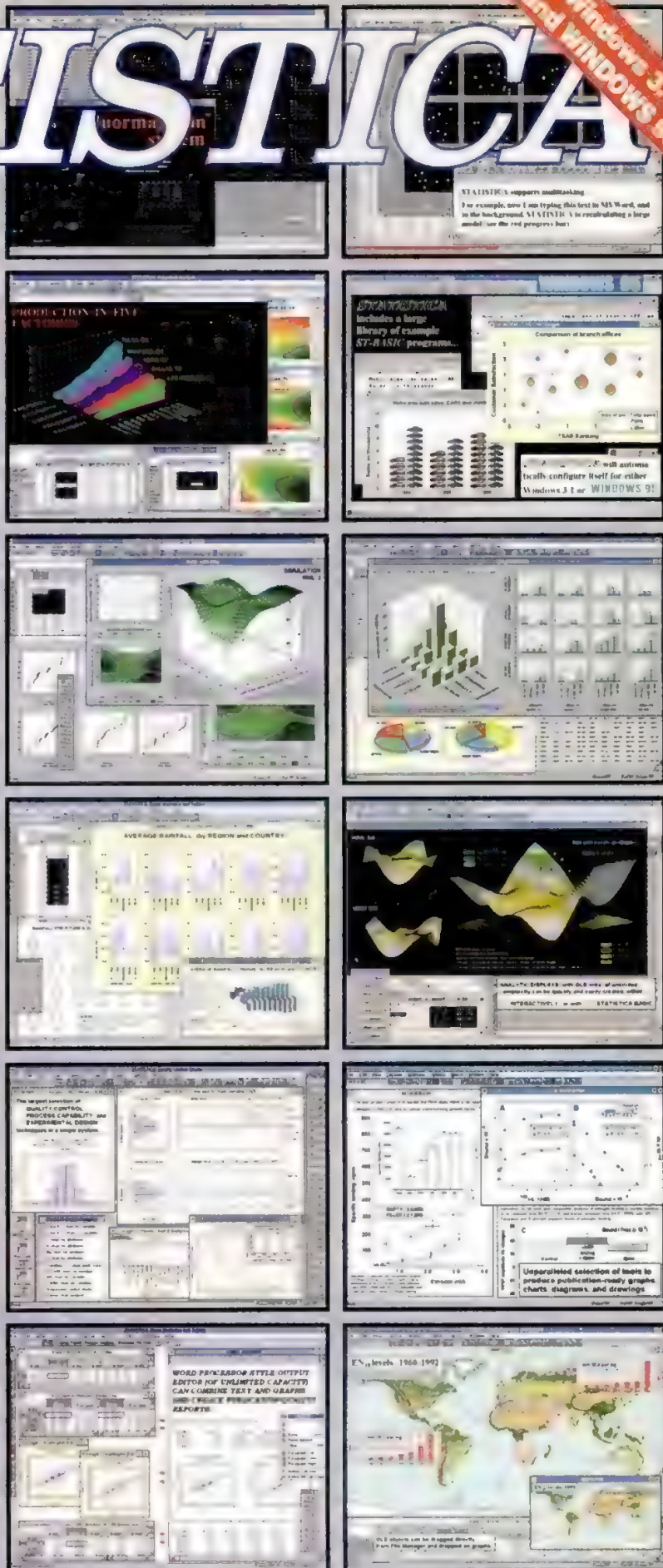
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ELECTRONIC PUBLISHING

Guide Passport Turns Documents into Hypertext

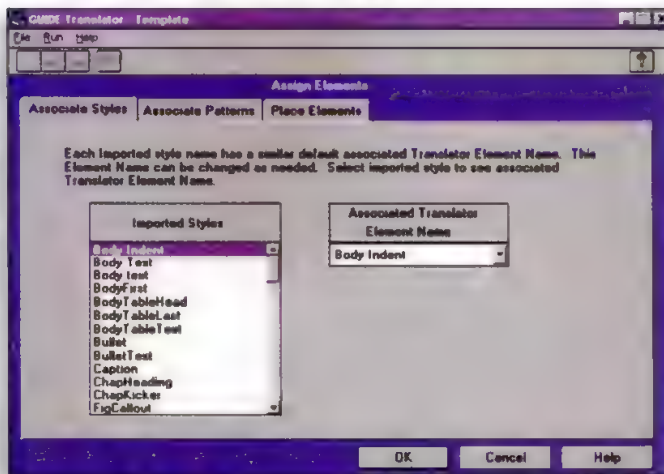
By Craig Stinson

With the introduction of Guide Passport, Info Access has taken aim at the broad middle of the electronic publishing market. Until now, the company has served both extremes of the market, with its \$45,000 Guide Professional Publisher SGML authoring environment at the high end and its \$800 minimally automated, highly programmable Guide Author program at the low end. The \$1,875 Passport program borrows technology from Professional Publisher to automate functionality that was already available in Author, which is included with Passport. Whether used to produce an internal policy manual for electronic distribution or a catalog for general release, Passport provides electronic publishing professionals with an extensive toolbox for turning word processor files into linked digital documents.

Passport works by creating reusable templates that govern the way style and content components of standard word processing documents are translated into hypertext electronic documents. The program reads style sheets in Microsoft Word, WordPerfect, Interleaf, and FrameMaker files, and works with rich-text-format documents. Graphics formats supported by the program include .BMP, .CGM, .GIF, .JPEG, .PCX, .TIFF, .WMF, and .WPG.

A given template can assemble many separate source files into a single linked document (chapter files into a book, for example) and can control the production of many standard corporate documents. You'll need to use Guide Author if you want to link your document to other applications or take advantage of Info Access's LOGiX programming language.

In addition to Author, the Passport package includes a document reader, which you may freely distribute, and a copy of an active reader. Called Guide Reader, this program lets users annotate documents, add bookmarks, and perform full-text searches, as well as



ROAD MAP: Guide Passport lets you control the appearance and hypertext behavior of style elements in your source documents.

pan, zoom in, and zoom out of the display of graphic elements.

By default, a Passport document includes three components: a table of contents, body text, and an index. Heading styles and index tags automatically become con-

tents and index entries, respectively, and these pointers may be used to navigate the body text. The individual source files that make up the document become separate frames, which also act as navigational aids. Indents, margins, and

MODEMS

AT&T's Latest Comsphere Lowers Price and Ups Security

By Earle Robinson

AT&T's Comsphere line of modems has long been known for high quality and high prices. The smaller and less costly Comsphere 3825Plus, which is priced at \$695, is aimed at the high end of the modem market now dominated by the U.S. Robotics Courier V.34.

The Comsphere supports all the expected line modulations from 300 bits per second through the V.34 standard for 28.8 kilobits per second. In addition, the modem supports the emerging 33.6-Kbps superset of the V.34 standard and V.32terbo. Obvious gaps include V.FC and V.23 modulations. Unlike its bigger brothers, the Comsphere offers Class 1 and Class 2 fax-transmission standards. The modem also implements AT&T's cellular error control (ETC), as well as V.42 and MNP4, with compression.

The modem's front panel has LEDs that monitor operation. As with the U.S. Robotics Courier, however, we miss the absence of details of the current speeds (such as transmission and reception) while on-line. Unlike the Courier, the Comsphere doesn't offer registers that detail and diagnose the number of block resends, speeds obtained, and line conditions.

The Comsphere shines in its security features. Network managers may use central and remote security with IDs, passwords, and callback options. Particularly useful against hackers dialing into your network is the silent-answer option. In this mode the modem sends no answer tone and waits silently for an ID and password from the caller. The Comsphere's manual offers full explanations of all commands.

Its thorough security, use of

tabs are computed relative to window dimensions, rather than with absolute measurements.

These choices are merely the program's defaults, however. During evaluation, we found that with a modest amount of effort, we were able to control the appearance and behavior of any document element to suit our needs. On the downside, this version of Passport does not support Microsoft Word for Windows 95 documents and failed to see headings in files converted from the latest version of Word to older formats. InfoAccess provided a workaround that solved the problem.

Passport is a versatile publishing tool, suitable for production environments and those users without a background in programming—provided those users don't mind doing a little study and wrestling up front.

Guide Passport. List price: \$1,875. Requires: 6MB RAM, 14MB hard disk space, Microsoft Windows 3.1 or later. InfoAccess Inc., Bellevue, WA; 800-344-9737, 206 747-3203; fax, 206-641-9367. Circle 434 on reader service card



HACKERPROOF: The Comsphere 3825Plus's silent-answer option enhances network security.

dial-in flash ROM upgrades of code, and outstanding manual make the Comsphere 3825Plus a formidable competitor for the U.S. Robotics Courier modem in the high-end communications marketplace.

Comsphere 3825Plus. List price: \$695. AT&T Paradyne, Largo, FL; 800-482-3333, 813-530-2000; fax, 813-530-2103.

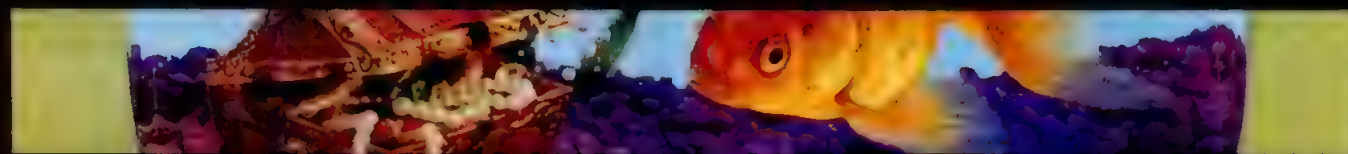
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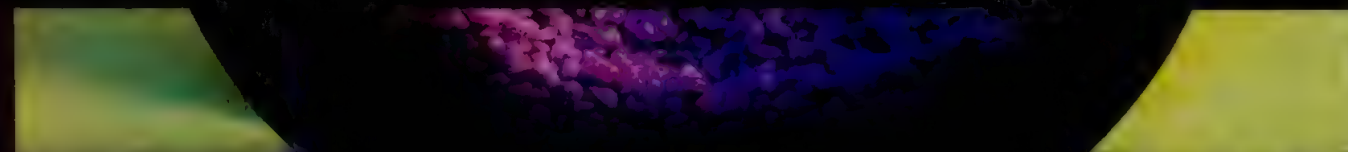
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*In Canada, call 1-800-887-8867. *Average U.S. street price. Monitor not included. †Source: 1994 J.D. Power and Associates Desktop PC Customer Satisfaction Study. **Study conducted among business. Second and third year, return to dealer. MS-DOS is a U.S. registered trademark and Windows is a U.S. trademark of Microsoft Corporation. Pentium and the Intel Inside logo are U.S. registered trademarks.

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Three years after we introduced network-ready HP PCs,

Compaq is touting theirs.
Wonder when they'll highlight
their prices.

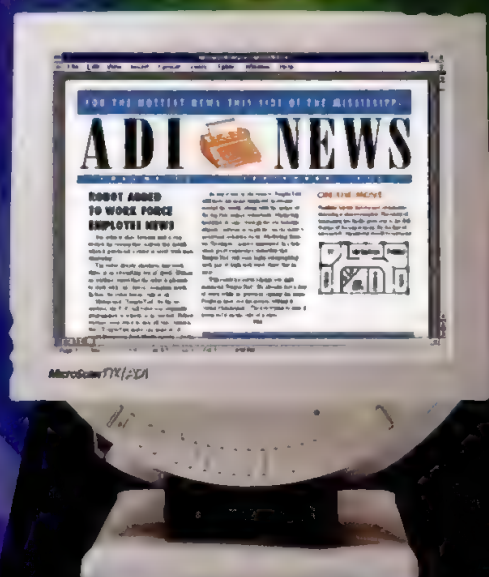
You may also wonder what Compaq means by 'network-ready.' For instance, are their PCs easiest to set up in multivendor networks? Is their management solution industry-standard – and can it manage all brands of PCs, not just their own? Are all management features available under Windows 3.1? Are they free? In HP's case, the answers are all yes.

In addition, HP ranked best overall among desktop PC business users in the 1994 J.D. Power and Associates Customer Satisfaction Study.¹

So why wait? Call 1-800-322-HPPC, Ext. 9385, for more information or the name of your nearest HP reseller. We're more network-ready than anyone.



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The ADI MicroScan™ 17X monitor is a concise answer to the problem of viewing oversized documents. It easily pivots from landscape to portrait mode—just click on the portrait driver icon, rotate the monitor and press the degauss button. You can view an entire legal or A4 page without scrolling or printing—ideal when you need to edit a lot of text. It also accommodates oversized spreadsheets, databases, and dozens of other applications.

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The MicroScan 17X is like getting a 21" display for the price of a 17" monitor. Its vertical viewing area in portrait mode is larger than any 17" or even 21" monitor on the market. And to make a long story short, it saves you countless hours of scrolling through oversized documents.

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The MicroScan 17X has lots of other things to write home about. Like a 17" CRT display with a 16" diagonal viewing area, 1024 x 768 resolution, flicker-free 76Hz performance, .28mm dot pitch, digital and microprocessor controls, even Plug-n-Play compatibility. And it's all backed by a three-year warranty. This is a feature set you won't find in competitively priced products. And since ADI builds monitors for leading PC companies worldwide, you know you're making a quality investment for the long haul. Get the full story on the MicroScan 17X—call 1-800-228-0530 for your nearest ADI dealer.



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CIRCLE 226 ON READER SERVICE CARD

New & Improved

NEWS OF ANNOUNCED PRODUCTS AND UPGRADES

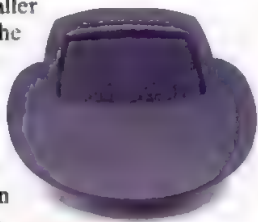
By Melissa J. Perenson

Desktop Gliders

The second generation of touchpads has arrived, and the good news is that they're now ready for the desktop. **Alps Electric's** \$89.95 Alps Desktop GlidePoint is about 40 percent larger than the original laptop version and includes an adjustable base, three programmable buttons, and Windows control panel software. The pad comes with a PS/2 connector and a serial port adapter.

RECTANGULAR: Alps' desktop touchpad.

For a design that's sleeker, more innovative, and more ergonomic, there's the \$59.95 Touché Touch Pad from **Touché Technologies**. Available in both serial and PS/2 port versions, the Touché pad has a slightly smaller surface area than the GlidePoint and uses Synaptics' neural-network-based touchpad technology, which offers the ability to move a cursor in one direction in the same fluid motion, even if you reach the end of the touchpad.



CURVED: Touché's ergonomic touchpad.

Desktop GlidePoint. List price: \$89.95. Alps Electric (USA) Inc., 800-825-2577, 408-432-6000; fax, 408-432-8337.

Circle 429 on reader service card

Touché Touch Pad. List price: \$59.95. Touché Technologies Inc., Sausalito, CA; 800-223-6433, 415-331-6622; fax, 415-331-6263.

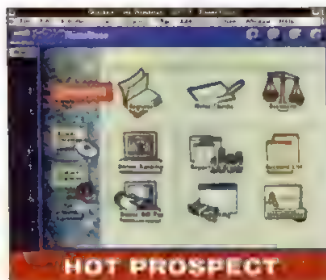
Circle 430 on reader service card

PC Card Modems Gain Flickering Lights

PC Card modems suffer from the same disadvantage as internal desktop modems: They don't provide a way to determine the status of a connection.

U.S. Robotics changes all that with its \$399 Sportster 28.8 PC Card FAX Modem with DataView Connector. The unique DataView connector provides users of PC Card modems with four LEDs, allowing users to monitor power, send, receive, and on-line functions during data and fax transfers. **Sportster 28.8 PC Card FAX Modem with DataView Connector.** List price: \$399. U.S. Robotics Inc., Skokie, IL; 800-342-5877, 708-676-7010.

Circle 408 on reader service card



Quicken's New Frontiers

The realm of personal-finance software is about to undergo yet another revolution. Leading the charge is a perennial favorite, **Intuit**, which is diversifying its Quicken product line with new releases.

Quicken 5 for Windows, which can be used with both Microsoft Windows 3.1 and Windows 95, is a \$40 software package that improves on Intuit's previous versions of Quicken by providing tight integration with a host of on-line financial services. The services, which are protected by RSA Data Security's encryption algorithm, include tools for investor research and stock tracking, online banking, and on-line bill payment. At \$5.95 per month for 20 on-line payments, Intuit is offering a service that rivals the cost of using the U.S. Postal Service.

The biggest advantage to these services is that you can now access account information from your bank or brokerage or even your American Express, MasterCard, and Visa accounts, and then download the account information directly into your Quicken records. Users of Intuit's TurboTax and Quicken Financial Planner can take the synergy one step further by using that same data for their tax and retirement plans. Other refinements include EasyAnswer reports, which are a simple means of extracting information about your expenditures and financial status during a given period.

Quicken 6 for Macintosh is now a native Power Macintosh application. The \$40 software has many of the same new features that are found on the PC version.

Quicken 5 for Windows. Estimated street price: \$40. Intuit Inc., Menlo Park, CA; 800-816-8025, 415-322-0573.

Circle 493 on reader service card

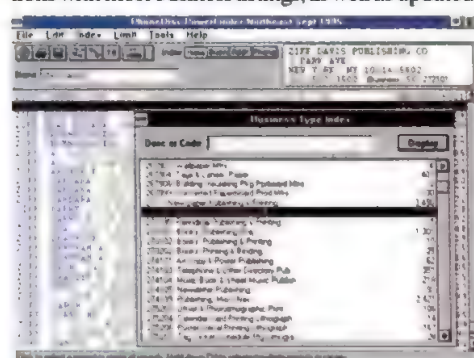
Retrieving Text on the Net

On-line publishing has never been easier, thanks to ZyIndex for Internet, a \$5,995 package that extends **ZyLAB International's** ZyIndex search engine and document management abilities for use with the Internet and other publishing platforms, such as CD-ROMs. This professional tool runs on a Windows NT World-Wide Web server and brings ZyIndex's full-text retrieval engine to the Internet. Seamless integration with existing versions of ZyIndex and Zylmage means that previously indexed files can be published on the Web without conversion from their original formats to HTML. Over 20 popular text formats are supported, including hyperlinks. Documents can be retrieved via content searches using any Web browser.

ZyIndex for Internet. List price: \$5,995. ZyLAB International Inc., Gaithersburg, MD; 800-544-6339, 301-590-2760; Web, <http://www.zylab.com>. Circle 416 on reader service card

Phone Home with CD-ROM Telephone Directories

Forget the clunky white pages. And the yellow pages too, for that matter. **Pro CD's** \$189 National Select Phone 1996 Edition has updated its data to include Standard Industrial Code (SIC) designations with most business listings, as well as updated



EASY SEARCHING: PhoneDisc offers several ways of looking up phone numbers.

listings for both the United States and Canada. Map view offers 16 zoom levels to show where listings are and the mileage between listings. Pro CD's new SmartFind feature lets you search for a listing based on whatever information is known. Pro CD also offers a dedicated Canadian directory.

Digital Directory Assistance has upgraded its PhoneDisc directory for Windows 95. The 32-bit, \$159 set of five CD-ROMs includes 100 million

New & Improved

phone listings and features AutoPlay support and Windows 95 Explorer-style file dialog boxes.

For general and specialized phone directories, turn to **American Business Information's** products, including the American White Pages (\$159) and such titles as the 800 Number Phone Directory, the 70 Million Households Phone Book, and American Yellow Pages series (prices start at \$120). The catch: For your initial purchase price, you can only view full records for 5,000 listings. **Select Phone.** List price: \$189. Pro CD, Danvers, MA; 800-992-3766, 508-750-0000.

Circle 431 on reader service card

PhoneDisc for Windows 95. List price: \$159. Digital Directory Assistance, Bethesda, MD; 800-284-8353, 301-657-8548.

Circle 432 on reader service card

American White Pages. List price: \$159. American Business Information, Omaha, NE; 800-555-5666, 402-593-4500; fax, 402-331-6681.

Circle 433 on reader service card

Sound, Sound Everywhere

Do you want to boost your old laptop with an external CD-ROM drive and sound? Then look no further than **Micro Solutions' 4X CD-ROM** with



SIDE SOUND: A CD-ROM drive with built-in speakers.

16-bit Built-in Sound. This self-contained \$529 solution for adding multimedia to your PC or laptop attaches via the parallel port and supports the Enhanced Parallel Port (EPP) and IEEE 1284 port standards for optimal data-transfer speeds; a printer pass-through device is provided.

When running on an EPP port, the unit is MPC-2 compliant. The quad-speed multisession drive has an integrated 16-bit stereo sound card for both 8- and 16-bit stereo playback; the sound card may be used independent of the CD-ROM drive.

4X CD-ROM with 16-bit Built-in Sound. List price: \$529. Micro Solutions Inc., DeKalb, IL; 800-890-7227 ext. 200, 815-756-3411; fax, 815-756-2928.

Circle 412 on reader service card

The Best of Both Worlds

ISDN technology may be the wave of the future, but it will take some time to get here. **3Com Corp.'s** 3Com Impact with Multilink PPP with v.32 bis modem, a \$749 combination, provides the one-two punch that's necessary for ISDN users to maintain backward compatibility with the countless analog connections from BBSs, on-line ser-

HARDWARE BRIEFS

The time has come to take the plunge and upgrade your system. **Improve Technologies** offers the \$99 Make-it 486 chip for upgrading 386 SX and DX systems to a 486. The chip, which is based on Texas Instruments' SX12-50MHz processor, includes 8K of internal cache. According to Improve, performance can be increased by up to 300 percent. 801-224-0088.

You can still salvage your old 386 and 486 Compaq Prolinea and Deskpro computers, whose proprietary designs preclude using standard Pentium OverDrive upgrade chips. **Advanced Logic Research** is offering the ALR Sequel 586, a system-board upgrade designed to turn your Compaq into a plug-and-play machine. Available in 75-, 90-, 100-, and 133-MHz Intel Pentium processor configurations, prices start at \$595 for a 75-MHz chip. 714-581-6770.

VideoLabs has assembled a hardware and software bundle for single-frame, 24-bit video capture and editing. The \$229 Digital Studio includes VideoLabs' Flex-Cam color desktop camera with an 18-inch, flexible gooseneck design, a T230Pro video-capture board, and Ulead System's software, VideoStudio for Windows. Also from VideoLabs is the \$229 VideoShot, a hand-held, stand-alone frame grabber that plugs into your parallel port; images are captured at 640-by-480 resolution. 612-988-0055.

Number Nine Visual Technology has dropped the price on its Imagine128, a 128-bit graphics accelerator board. The boards start at \$549 for 2MB of VRAM, and include Number Nine's suite of Windows 95 utilities. Number Nine has also released an \$899 Power Mac version of the board with 4MB of VRAM standard. 800-438-6463.

NuSound PnP is the latest offering from **Orchid Technology.** The \$249 Sound Blaster-compatible card combines wavetable synthesis, 3-D Spatializer technology, and 18-bit digital-to-analog converters. Bundled with the card is the NuPanel front control panel, which fits into a 3.5-inch drive bay and provides immediate access to volume control, a 3-D intensity switch, a mute button, and input and output jacks. 510-683-0300.

Tired of stacking CD-ROM jewel cases on top of one another? **CaseLogic's** ProSleeves, priced at \$5.95 for 15 and \$19.95 for 50, are soft plastic, padded sleeves that include separate slots for the CD and the CD's paper insert. 800-447-4848.

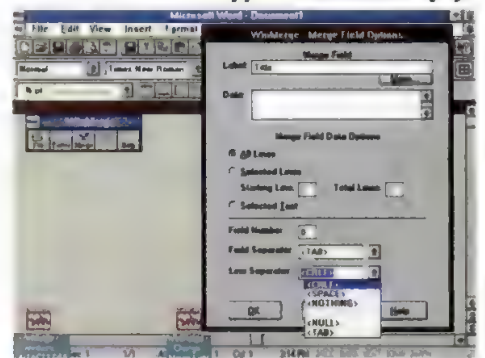
vices, and businesses not yet offering ISDN. The biggest plus to this all-in-one solution is that it requires just one communications port for both connections. The biggest drawback: 3Com only includes a 14.4-Kbps fax modem, which is bound to be a difficult transition for anyone after using ISDN.

3Com Impact with Multilink PPP with v.32 bis modem. List price: \$749. 3Com Corp., Santa Clara, CA; 800-638-3266, 408-764-5000.

Circle 425 on reader service card

Merging Sights

Napersoft's productivity-enhancing WinMerge 2.0 simplifies the process of merging data from most Windows-based applications into such pop-



FROM HERE AND THERE: WinMerge lets you easily define merge fields for any Windows application.

ular word processors as Microsoft Word, WordPerfect, and AmiPro. This \$69 package makes customized correspondence easy to assemble, thanks to the Screen-Scraper engine that pulls data out of applications and inserts it into your word processor via a document link. You needn't be familiar with your word processor's merge functions; just use the WinMerge toolbar that's automatically integrated into your word processor. This Windows 3.1 version features integration with Delrina Corp.'s WinFax; the upcoming Windows 95 version will include support for Internet e-mail. **WinMerge 2.0.** List price: \$69. Napersoft Inc., Naperville, IL; 708-420-1515.

Circle 420 on reader service card

Covering the Spectrum

Tamarack Technologies' Z1-600 delivers a 30-bit color flatbed scanner for just \$699, a price that's comparable with that of many 24-bit scanners. The Z1-600 offers 300- by 600-dot-per-inch opti-

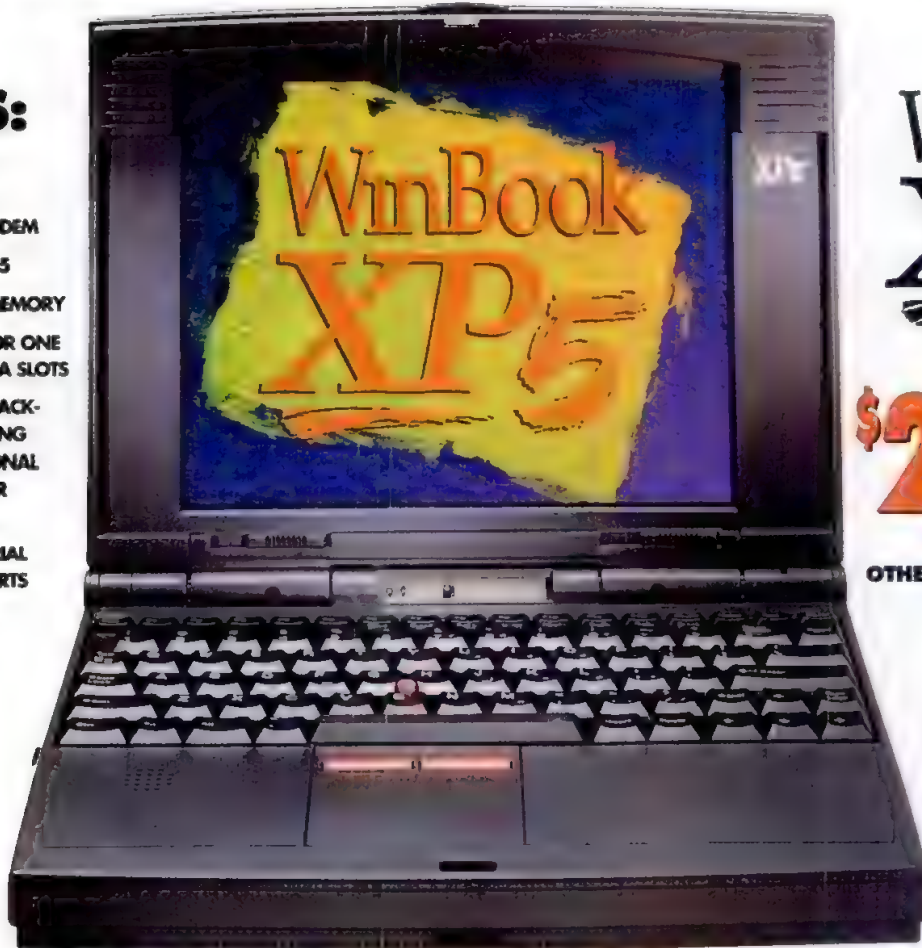
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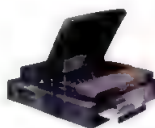
OTHER MODELS AVAILABLE



The 17-award-winning WinBook XP goes Pentium! Introducing the WinBook XP5—with the features you want in the highest quality, best value notebook. At \$2999, you get an amazing list of standard features including: 75MHz Intel® Pentium processor, lithium batteries, 10.4" TFT active matrix screen, 16MB RAM, an 810 MB hard drive, and more.

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cal resolution in a single-pass scan. According to Tamarack, it should take about 35 seconds to scan a letter-size document. The scanner, which connects via a SCSI port, includes Twain drivers and OCR software; an optional automatic document feeder costs \$495.

At the higher end of the scanner market is **UMAX Technologies'** Mirage D-16L, a \$6,995 large-format color scanner that supports tabloid (A3-size) documents. The Mirage's large surface area, combined with UMAX's MagicScan software and the assorted frame holders available, make this unit ideal for multiple-image scanning. You can scan up to 32 35-mm slides or eight 4- by 6-inch photos simultaneously. UMAX's software automatically separates each image into its own file. Dual-lens technology yields high-resolution images of up to 800 by 1,600 dots per inch.

Tamarack Z1-600. List price: \$699. Tamarack Technologies Inc., Orange, CA; 800-598-3918, 714-744-3979; fax, 714-744-4582.

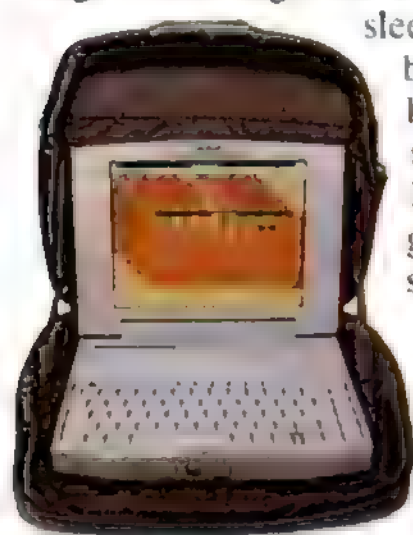
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Mirage D-16L. List price: \$6,995. UMAX Technologies Inc., Fremont, CA; 800-562-0311, 510-651-4000; fax, 510-651-8834.

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Tired of making do with an overstuffed briefcase to tote your laptop around town? **Tenba**, which has nearly a two-decade tradition of designing and building bags for photographic equipment, is expanding its horizons with a line of computer bags. These bags, which run the gamut from a



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sleek, \$150 ballistic nylon briefcase to trendy \$100 knapsacks and even a stylish \$300 women's handbag, are all intelligently and sturdily designed solutions for those who need to carry their laptops. **Tenba Computer Back Packs.** List price: \$100-\$200. Tenba, New York, NY; 212-966-1013; fax, 212-334-0841.

Managing Your PC Cards

Award Software International's \$59.95 PC Card utility, CardWare 2.5 Plus, helps take the headache out of managing PC Card compatibility and memory problems. CardWare, which is designed for both experienced and novice PC users alike, has added plug-and-play and multifunction PC Card support. CardWare also optimizes your PC Card's conventional memory usage, handles power management,

allows hot-swapping of cards in DOS or Windows, and accommodates mixed voltages among cards. **CardWare 2.5 Plus.** List price: \$59.95. Award Software International Inc., Mountain View, CA; 415-968-4433; fax, 415-968-0274.

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Mathcad 6.0 for Windows. MathSoft's popular math, science, and business tool, has added integration with the World-Wide Web in addition to Lotus Notes and several other e-mail systems. The 32-bit software also has added new statistical options, data analysis, and math-notation functions, as well as improved text formatting. 800-628-4223, 617-577-1017.

For a complete set of graphics-presentation tools, look toward **Asymetrix Corp.'s** Asymetrix Multimedia Creative Suite. The \$200 package includes Asymetrix Digital Video Producer, Asymetrix 3D F/X, Compel 2.0, and Media-Blitz!. 800-448-6543, 206-462-0501.

Poly Software International's \$299 32-bit version of PSI-Plot offers improved data analysis features, plotting abilities, and export filters in its popular plotting software. 801-485-0466.

Curious about how your system's resources are holding up under Windows 95? **BonAmi Software Corp.'s** \$79 Performance '95 provides real-time CPU and RAM performance monitoring and analysis. 508-371-1997.

A \$3,999 application development environment from **IBM Corp.**, VisualGen, Version 2.0, improves the speed at which multiplatform client/server and stand-alone applications can run and adds a graphical interface and DDE compatibility. 800-426-3333.

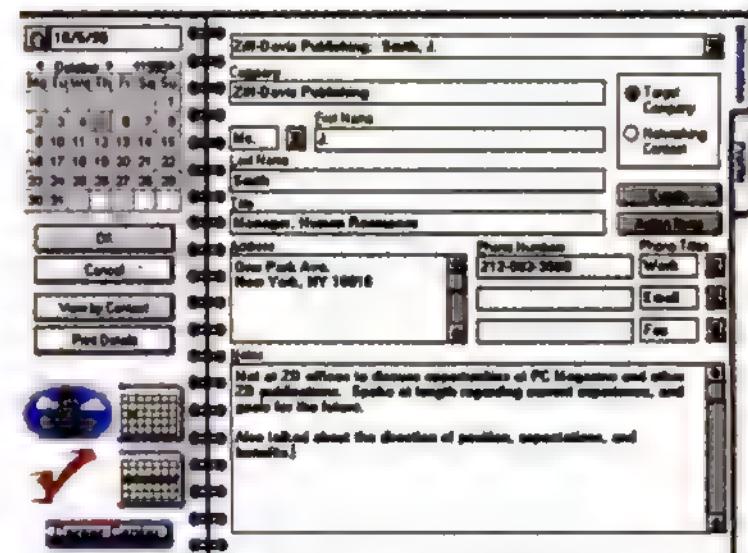
Interactive Catalog Corp.'s \$4,995 iCat Electronic Commerce Toolkit, Version 2.0, lets you create an interactive catalog for CD-ROMs or the Internet with ease. The kit includes everything you need to produce engaging, visually enticing catalogs. 800-558-4228.

Wrestling with business problems? **MindLink Software's** \$299 MindLink Problem Solver, Corporate Edition, is a useful tool for helping you arrive at creative and innovative solutions to your business's problems. 800-253-1844, 802-457-2025.

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Frustrated at the direction in which your career's headed? Whether you're an experienced executive or just starting out, one of these personalized career guidance counselors may help.

Explore your career options with **OnTrack Media Corp.'s** \$49.95 CareerPath. This sleek CD-ROM offers a Career Analyzer that helps you determine the right career for you. It also provides details on careers from the U. S. Department of Labor's databases.



CAREER ADVICE: ResumeMaker helps you track your contacts and create professional résumés.

When you're ready to spruce up your résumé, **Individual Software's** \$40 ResumeMaker Deluxe CD provides a convenient way to do so. In addition to a selection of aids for crafting engaging résumés and cover letters, there's an integrated contact manager, job-search advice, and Virtual Interview sessions.

Adams New Media's \$50 Adams Job Bank puts the popular regional employment directories on disk. You can search through 7,500 employer profiles by industry, state, or position. You'll also find résumé aids and job-search advice. Best of all, the software is integrated with Adams Job-Bank Online, which provides current job listings nationwide via the World-Wide Web at <http://www.adamsonline.com>.

CareerPath. List price: \$49.95. OnTrack Media Corp., San Francisco, CA; 800-505-5627, 415-885-4920; fax, 415-885-3074.

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ResumeMaker Deluxe CD. Estimated street price: \$40. Individual Software Inc., Pleasanton, CA; 800-822-3522, 510-734-6767; fax, 510-734-8337.

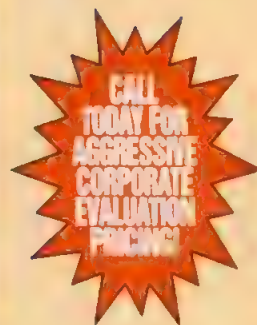
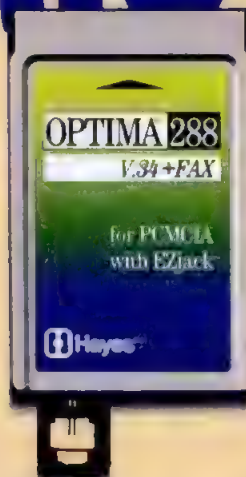
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Adams JobBank. Estimated street price: \$50. Adams Media Corp., Holbrook, MA; 800-872-5627, 617-767-8100; fax, 617-767-2055.

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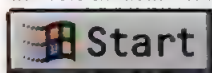
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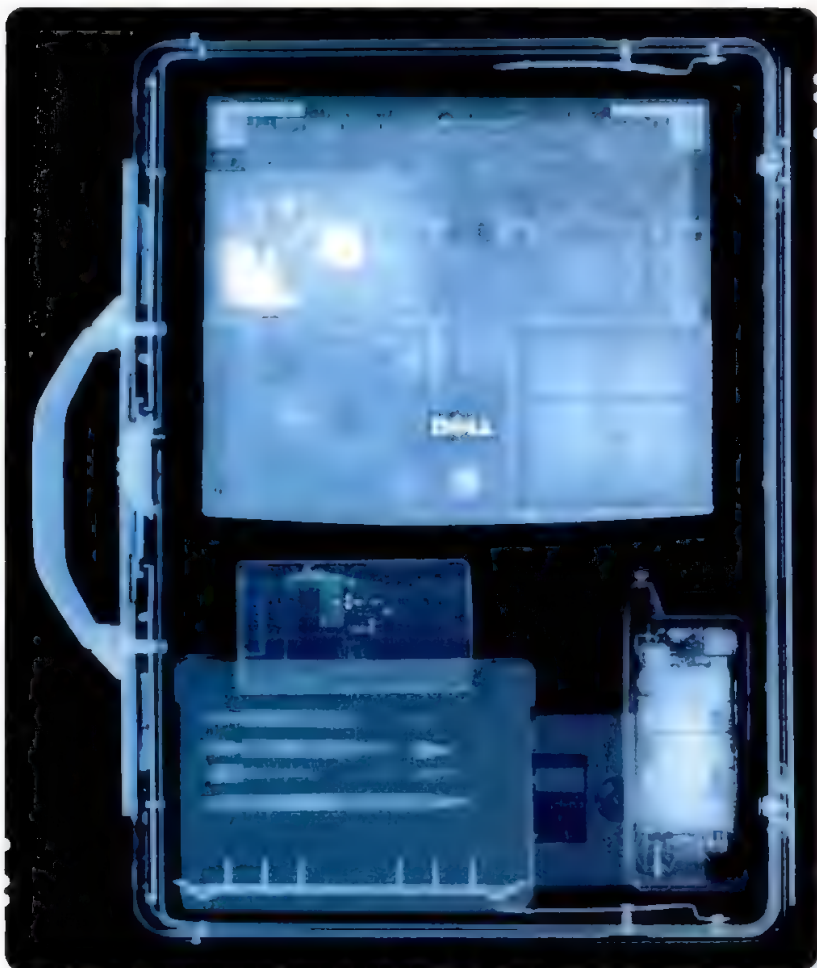
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Read Only

REVIEWS OF THE LATEST BOOKS FOR THE PC USER

Edited by Tin Albano

On the Road Down the Last Great American Highway

BY MARY PAULSON

"The Future is an elusive beast," begin David Kline and Daniel Burnstein in their new book, *Road Warriors: Dreams and Nightmares Along the Information Highway*. "It is a ghost, a specter wandering somewhere out in that distance between tomorrow's enormous possibilities and today's prosaic realities." With all the hype that's been generated over the last few years concerning the information age, you might feel like you're chasing a ghost. Five hundred channels, virtual communities, interactive everything: Better jump head first onto the information train because the ideas only get bigger the longer you wait. You don't want to feel like an uninvited guest to the



most important party of the century, do you?

Road Warriors tracks the tremendous advances of the latter part of this century: the Japanese inclusion in the pioneer world of American technology, the microprocessor of the eighties, HDTV and General Instrument's precedent-setting all-digital approach, the near merger of TCI and Bell Atlantic. Burnstein and Kline take care to emphasize not only the technologies themselves, but the string of events that led up to each, and the consequences that ensued, for an easy-to-follow background of today's events. Further discussions about privacy issues, the debate over government intervention, and the ever-increasing split between the haves and the have-nots give the book an added human dimension.

Particularly engrossing are the many points of view on the Digital Revolution, and the corporate battlefield to which it led, by some of the greatest technological visionaries of our information future. Most notable of these are: John Malone, chairman of Tele-Communications Inc. (TCI), the largest cable television company in the U.S.; Ray Smith, chairman of Bell Atlantic; and Reed Hundt, chairman of the Federal Communications Commission. Other participants include General Magic CEO, Marc Porat, and psychologist Denise Luria.

Many questions about the new wave of technological events remain unanswered, such as: "How will this affect me? What will happen to my world, and how do I prepare for it?" The Digital Revolution is here and,

like the Industrial Revolution before it, promises to change our lives in ways we only can imagine.

Though it doesn't offer any conclusive answers to such open-

"What does the future look like? For some—the affluent, the mobile, the educated—it promises a wonderland of new choices and new opportunities in work and leisure. But for others—the unskilled, the underclass, the unnecessary—it may offer only banishment to a new... Dark Ages."

—ROAD WARRIORS

ended questions, *Road Warriors* at least acknowledges their importance, bringing into the discussion the human elements that previously were lacking. In short, *Road Warriors* is an intelligently written, enjoyable read; it chronicles the events, mergers, and players responsible for this new age, and cites the many social, cultural, and political conflicts that are sure to shape its future.

Road Warriors: Dreams and Night-

mares Along the Information Highway, by Daniel Burnstein and David Kline, \$24.95. Dutton Books, 800-526-0275; ISBN: 0-525-93726-9

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READ ONLY RECOMMENDS



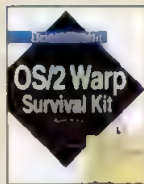
Doug Azzarito and David Green's *The OS/2 Warp Survival Guide* is one of the best "how-to" books

written for IBM's operating system. First-time OS/2 Warp users will benefit from the step-by-step instruction, and those who are more experienced with the operating system will find *The OS/2 Warp Survival Guide* a useful reference tool. \$29.95, John Wiley & Sons Inc., 800-225-5945.



The Warp Book, by Barrie Sosinsky, does what every software guidebook should do: explain the

purpose of the product, help get the user up and running, cover all the basics, and provide helpful tidbits of information. The problem is not the content of the book, but the way it is presented. The book's layout—text and illustrations—is a little sloppy and confusing. \$24.95, Prima Publishing, 800-255-8989.



Brian Proffit's *The OS/2 Warp Survival Kit* is a handy little guide for first-time OS/2 users. Unlike other

guidebooks, *The OS/2 Warp Survival Kit* isn't cluttered with overly technical information. Proffit adequately covers all the basics in a clear, straightforward manner. Each chapter includes illustrations, examples, and bits of helpful advice. \$19.95, Addison-Wesley Publishing, 800-447-2226.



Bruce Hallberg takes a somewhat different approach in *Using OS/2 Warp* than we see in more

traditional guidebooks. Instead of leading the reader through a series of steps, Hallberg set up his reference book in a question-and-answer format. Hallberg hopes his book has every question (and answer) you might have about OS/2 Warp. And it almost does. \$19.99, Que Corp., 800-428-5331.

Okay. So you hold on to things. But who do they come to for a copy of last month's report? Exactly. Perhaps you'd be interested in the LTE 5000 — a new Pentium® powered notebook featuring interchangeable devices — so you can, among other things, add enough storage to dwarf an airplane hangar. Its front-loading MultiBay makes it completely modular, so you can mix and match capabilities as you see fit. Choose from a second hard drive, a CD-ROM drive, a second battery, or a floppy drive to create the notebook that's right for the task at hand. An expansion base also features two additional MultiBays, in case 2.7 GB isn't enough. Interested? Call us at 1-800-345-1518 (select PaqFax) or visit our Web site at www.compaq.com.*

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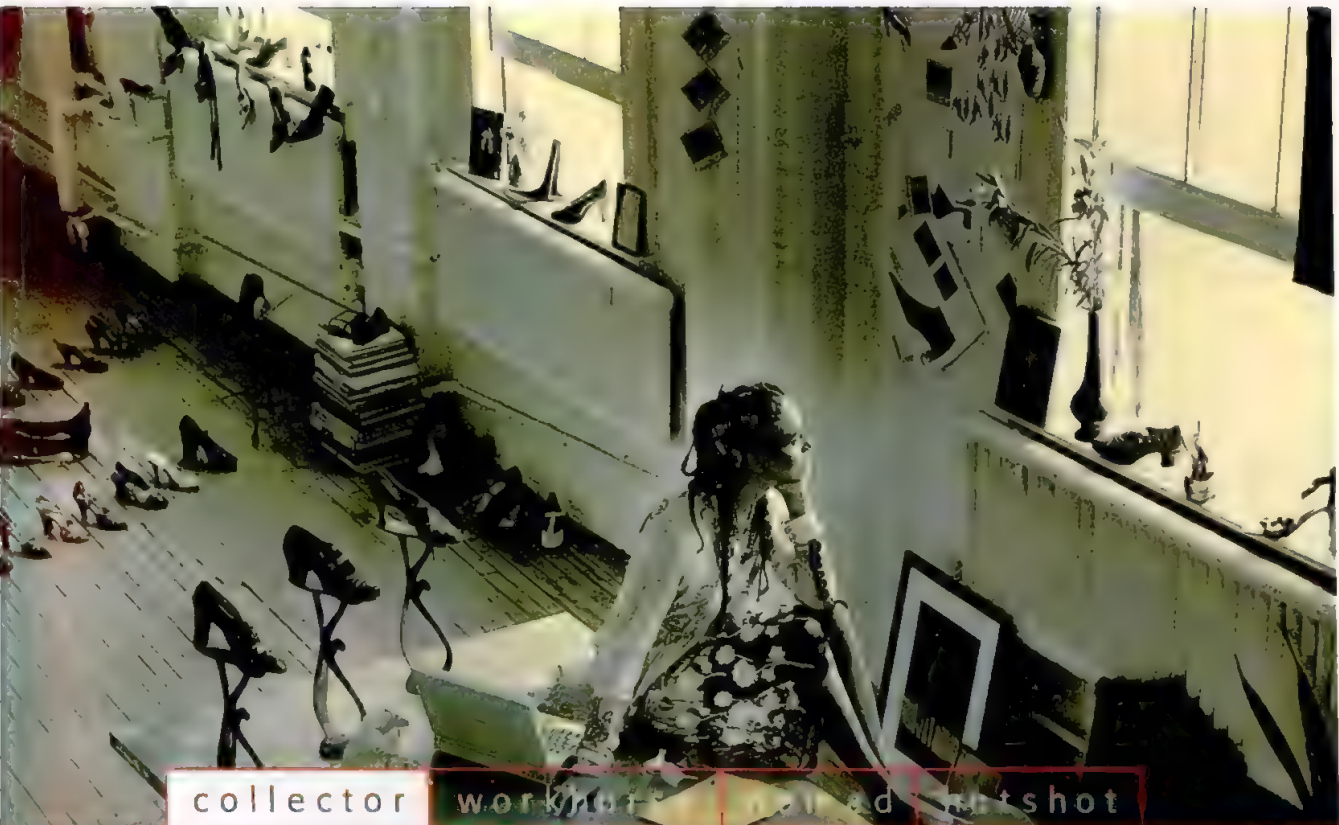


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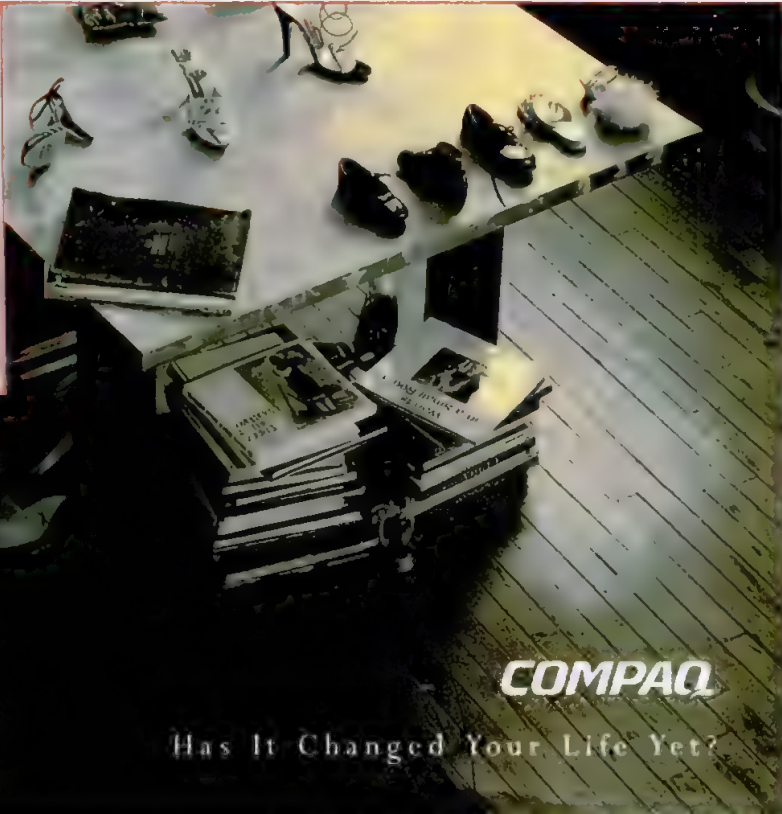
A woman with long dark hair, wearing a floral dress, stands in a room that appears to be a shoe store or a collector's space. The floor is covered with numerous pairs of shoes, some on stands and others scattered. In the background, there are stacks of books and a whiteboard. The lighting is warm and slightly dim, creating a cozy but cluttered atmosphere.

collector worker model shot

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A close-up view of a desk or table. On the surface, there are several pairs of shoes, including high heels and casual shoes. A stack of books is visible in the foreground, with some titles partially legible. The background shows a wooden floor and a window with a plant.

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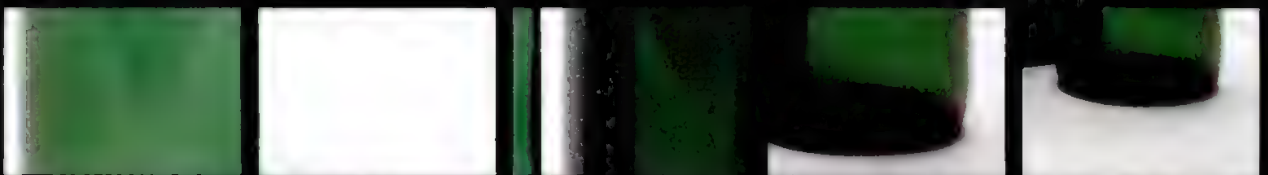
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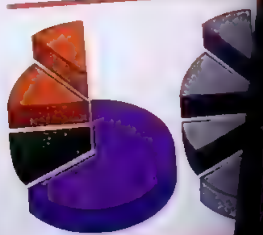


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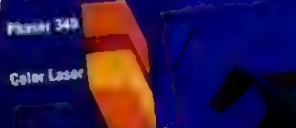


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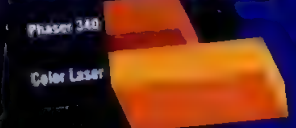
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Michael J. Miller

Casting a Net Beyond HTML

When you consider that it took years before word processors, graphics, and spreadsheet programs could read each other's formats, it's a bit of a miracle that the PC industry got its act together quickly and agreed on HTML as a standard format for

the World-Wide Web. Guess what? The party's over. We're going to see a lot of competition as companies look beyond HTML and vie for future Web standards.

HTML is great for displaying text along with limited graphics, but it has so many shortcomings it's possible that other formats could become common on the Web as well. HTML's universality may be jeopardized as more and more companies try to extend HTML through proprietary extensions.

Let's start with the two heavyweights. In my last column, "Warfare on the World-Wide Web," I gave you a rough sketch of the skirmish over HTML extensions, with Netscape gaining an early advantage, Microsoft pushing to get in the act, and others just trying to keep up. Well, Netscape just widened the battlefield by agreeing to use Sun Microsystems's Java language as a scripting tool, and by using other tools such as Adobe Acrobat and Macromedia Director as ways of presenting more complex information.

SUPPORTING SCRIPTING

Scripting is the first step toward making the Internet a platform. Once application developers and end users can write scripts that will work on the Web, the way we think about and use the Internet will change dramatically. With applications written for this new platform, we'll see Web pages become more interactive and more personable. (One dark word on this otherwise bright future: We may also see the first Web virus.)

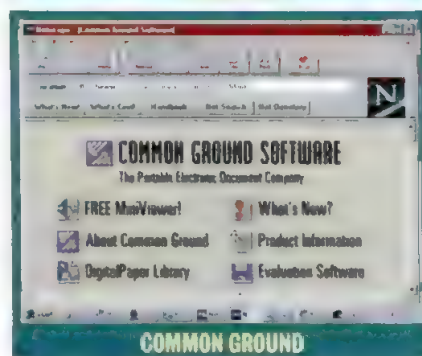
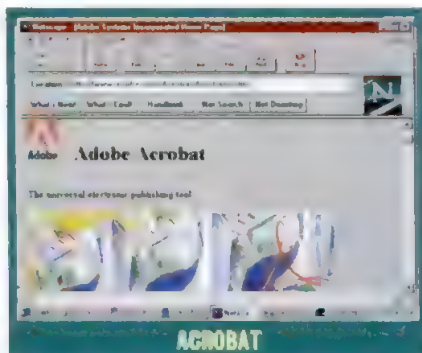
Sun currently has the lead with its Java programming language for the World-Wide Web. Java essentially lets users run computer programs through their browsers, giving those Web sites that support Java an extra

added dimension.

Netscape, preparing (and preparing for) the future of the Web, licensed a subset of Java, making its Navigator 2.0 scriptable. Whether Java is the best possible scripting language isn't the point. As I've said before, what is important is that it's here now. And this alone gives Java the real possibility of becoming the de facto standard, just as the Netscape extensions to HTML have become a standard. The Netscape extensions/Java language combo should give Navigator a powerful one-two punch.

There are other companies with alternative scripting languages, such as Dave Winer's Frontier (check out <http://www.hotwired.com/davenet>) but getting out on the

Web first gives Java a pretty sizable advantage. Also, don't expect Microsoft to stay out of this fight. Microsoft has previously stated its intention to be a major player on the Internet and to make its Visual Basic for Applications the scripting standard everywhere. I certainly expect Microsoft to bring Visual Basic to the Web. Stay tuned: Microsoft is sure to have an answer to Netscape's latest foray.



One Web page was designed with Acrobat, the other with Common Ground.

PORTING PRETTY PAGES

Scripting isn't the only area where we'll see companies competing for standards beyond HTML. Let's take a look at how on-line publishing will increase our ability to create better-looking Web pages with funkier fonts.

Since HTML is so limited, taking a highly formatted document and posting it on the Web is real challenge. HTML doesn't even let you choose the fonts that are displayed on a Web page. These limitations have given creators of portable-document products the chance to create Web standards that will give us the capability to

Michael J. Miller

create more professional-looking documents.

Adobe already has an agreement with Netscape: Navigator will support Adobe's Acrobat format for viewing portable documents. Acrobat lets you create pages that look more like printed pages, and it's cross-platform. It was originally designed so that a document (anything from a corporate policy memo to a magazine) would look the same way when viewed on just about any computer.

Acrobat pages have major advantages over HTML documents. Acrobat pages can be highly formatted, and these pages can contain any fonts and graphics in the exact same way they appear in a desktop publishing product.

Another portable-document manufacturer and one of Adobe's main competitors, Common Ground Software, has recently shipped its Common Ground Web Publishing System. Common Ground's primary advantage lies in its ability to let you download only particular pages over the Web,

while Acrobat still requires you to download the whole document. Adobe says this will change in the near future.

Either solution will let you see pages that look more like printed pages, but there's a price to be paid. HTML documents tend to be a lot smaller, since they use only text for text, not fonts for representations. In many cases, text ends up being more readable than fonts—even if it's not exactly what the creator used.

BEYOND TEXT AND GRAPHICS

Attempts at improving how text and graphics are rendered on the Web is only the beginning. There are several emerging technologies for transmitting voice over the Internet, including Progressive Software's Real Audio (now bundled with Microsoft's browser) and VocalTec's Internet Wave.

Even MathSoft is getting into the act: Its Mathcad software lets you see documents in a new format designed to better represent mathematical formulas. Netscape recently purchased groupware maker Collabra with an eye toward making Collabra's threaded discussion software a standard.

To date, most of these technologies have been adopted as "helper" applications that plug into browsers and give them more capa-

bilities. That's good because it lets us mix and match functionality with the browser we want.

THE VIRTUAL BATTLEFIELD

The mother of all Web wars may be fought over standards for creating virtual worlds: 3-D interactive simulations of rooms and worlds that you can move through. We're only about 18 months away from seeing interactive "virtual reality" sites becoming popular on the Net. For some sneak peeks, check out the Virtus, Netscape, and Worlds Inc. sites (<http://www.worlds.net>).

A number of companies, notably Intervista, Silicon Graphics, and Template Graphics Software are backing a virtual reality authoring language called the Virtual Reality Modeling Language (VRML) as a standard for building virtual worlds. VRML grew out of work done by Silicon Graphics and is now driven by a rapidly growing committee that is quickly broadening VRML's horizons.

VRML varies from older specifications that let users download a single graphic at a time. VRML is designed so that you can download a 3-D polygon-based scene. The latest version of the VRML specification now promotes interactivity by letting you work with individual elements of the virtual worlds. □



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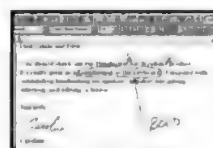
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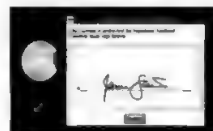
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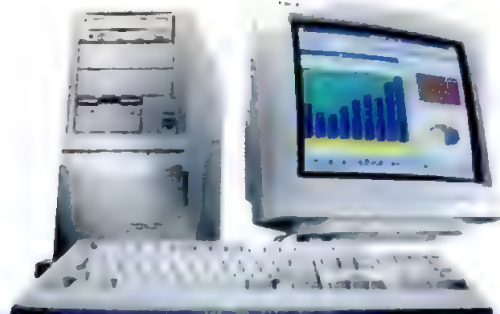
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PC Magazine - Sept. 12, 1995, on the SyncMaster 17GLi and 17GLSi monitors.



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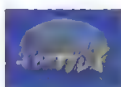
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SAMSUNG



Bill Machrone

Topsy and the Internet

Ever heard the phrase, “grew like Topsy?” Most people misuse it to mean that something happened quickly, like wildfire. Actually, Topsy was a fabulously successful racehorse. Of his parentage and lineage, his trainer said, “He don’t have no lineage. He

just grewed.” The Internet is this decade’s Topsy. It just grewed. And those of us who use it have to deal with the ramifications.

If you want to surf the World-Wide Web today you need something even more than a V.34 modem: patience. With everyone, including me, touting the Web so highly, people are rushing to sign up. They’re running headlong into complexities and incompatibilities that leave them wondering if it’s worth the effort. Or they surmount all the obstacles, only to find that service is so slow that navigating from site to site is like wading through Jell-O.

The Web browsers are getting dramatically better, but the installation programs for the Windows sockets (drivers for the Internet’s TCP/IP protocol) and dialers are, for the most part, terrible. They neglect to tell you the basics, such as what a Winsock is and why you need one, and they seldom do a good job of explaining your options and responses as you fill in the blanks and choose a service provider. The companies are so steeped in their technology and the difficulty of what they’re doing that they’ve spent little time on human factors and usability.

Their job hasn’t been made any easier by the constant evolution of standards, including the replacement of SLIP by PPP as the most widely used connection protocol. Most of the installer programs still ask you for an IP address and several other imponderables. When you call tech support, the folks there tell you, “Oh, just leave that stuff blank.” If you don’t need it, why are you asking me for it?

The phenomenal popularity of the Web took the industry by surprise. Networks were left gasping for capacity as millions of people started dialing in. This last point is crucial. The Web was designed in an environment where everyone was

connected to fast networks. It’s a happy accident that 14.4- and 28.8-Kbps modem speeds have come along just as the software became available to dial into the net. But the shareware and commercial sockets are still asking Windows to do things that it wasn’t designed for. Chaos reigns.

Meanwhile, Netscape utterly dominates the browser market. Today, you can’t get the full benefit of the Web without a Netscape browser. It implements a number of extensions to HTML that Web designers have adopted enthusiastically, such as tables and backgrounds. These things are defined in HTML 3.0, but Netscape was the first to implement them, and so established a hegemony. Fortunately, the Netscape betas are free; you can download them from Netscape’s sites, and from many educational sites. People put up with the bugs to get the features. Every other browser vendor is hard at work implementing the HTML 3.0 extensions. By year’s end, all the browsers will be on an equal footing with Netscape, which will pose some challenges for the recently public company.

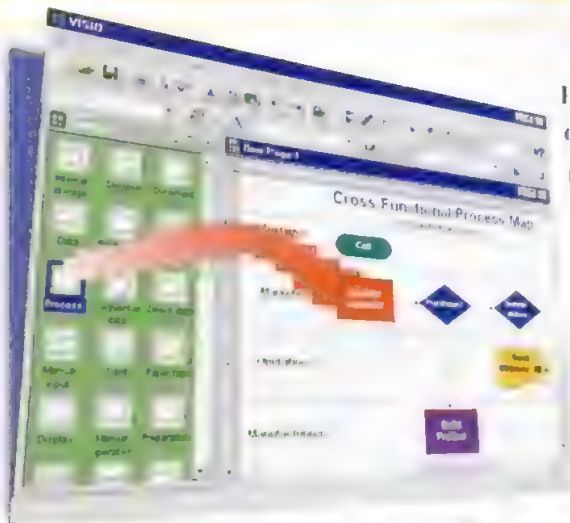
There’s light at the end of the ease-of-use tunnel, too. Quarterdeck’s InternetSuite is an interesting variation on the Mosaic browser with an excellent tree-structured approach to organizing favorite sites. It’s also the fastest Web browser we’ve yet seen.

But the real gem of the package is the Location Manager. Working with the install program (which has an incredibly complete list of service providers, both domestic and overseas), it determines which phone number you should use. This is a tremendous boon to notebook users who access the Net while on the road.

Someday, all Internet access software will be this good. In the meantime, InternetSuite will be one to watch as it comes up to full HTML 3.0 capability. □



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Second Looks

LIVING WITH THE PRODUCTS WE REVIEW

Creative Ways to Help Jog Windows Memory

As Windows' last days approach, its memory management deficiencies are really coming to the fore, but so are the solutions. Windows 3.1 and Windows for Workgroups 3.11 are amazingly inconsistent in their abilities to run multiple programs. They sometimes run out of system resources or low DOS memory and may run as few as two programs, even if you have 32MB of RAM. Programs that open multiple windows and track many objects gobble system resources.

Most programs need memory in the DOS 640K area to communicate with the operating system and with one another. Some programs and many drivers hog this space and

insufficient space for system resources. It compresses the system-resources area effectively, but it does more. It grabs the entire low-memory area and yields it only to GlobalDosAlloc calls, forcing applications to use extended memory.

RAM Doubler was far and away the most effective of the programs I tested and is highly touted by readers who have tried it. It utterly eliminated memory constraints on the machines I tested, allowing me to load as many as eight or nine programs. A few users have reported conflicts with video drivers that hot-switch resolutions, but I would rather have more apps than variable resolution.

MoreMem is a shareware product that fragments the lower 640K into small pieces and comes with comprehensive memory-management utilities. If you're a tuner and tweeker, this program is a delight. Taking the default settings, however, it didn't do all that much. It brought one system up to six apps, another to four apps, and had no positive or negative effect on a system that didn't exhibit memory-constraint problems.

A *PC Magazine* utility, 1MBFORT, which also fragments low memory, is available for free from CompuServe and the Internet. It got one system from two to four apps and another from three to four.

SoftRAM looks great on paper, claiming to compress not only the system resources memory but also the low DOS memory. I tested it on one system, and it raised the number of programs I could run from two to three. On another system it decreased the number from four to three. On a third system it had no discernible effect. SoftRAM is selling like hotcakes; I'm having trouble understanding why.

Apart from the freebie, all of these products are expensive for what they do. You're really paying for the authors' arcane knowledge of Windows bugs and design flaws.

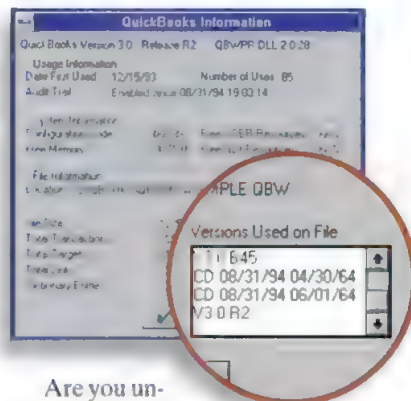
—BM

RAM Doubler (see First looks, August 1995) was the first commercial product to address the memory problem. Most people look at RAM Doubler strictly as a way to deal with

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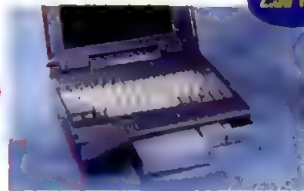
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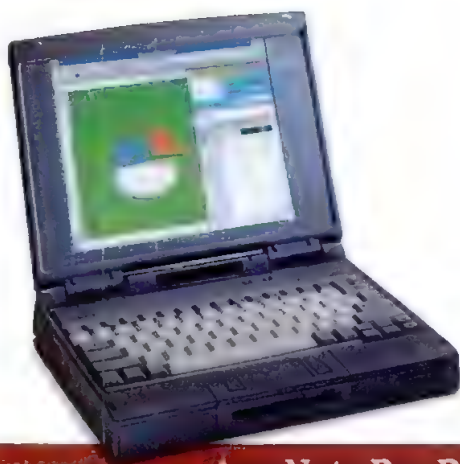
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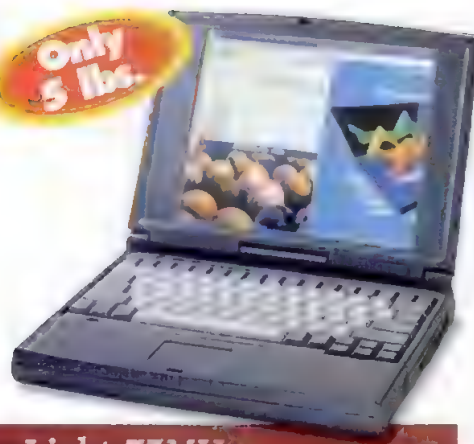
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CIRCLE 152 ON READER SERVICE CARD



John C. Dvorak

Microsoft Under Fierce Attack

Most of the battle has taken place on-line, but much of what happens in the underground bubbles to the surface eventually. None of which bodes well for Microsoft, as the company is now the target of an elusive campaign to smear Windows 95 in particu-

lar, and the company in general. Microsoft is thought of more and more as a bully that deserves punishment. It seems that the only response the company has is to try to buy influence. Much of the attack against Microsoft comes from Team OS/2.

This stems from when IBM tried to trademark the term "crashproof" for OS/2. Saying it was crashproof was nothing more than another bonehead marketing ploy from IBM's software marketing group. During this crashproof phase Microsoft honcho Steve Ballmer personally walked around Comdex with a disk that he shoved into a variety of OS/2 machines. The disk crashed OS/2 systems as he cackled: "Crashproof? I think not!"

This disturbed the OS/2 mavens, and especially the loosely knit group of IBMers and OS/2 devotees called Team OS/2. The group traces its roots to early efforts by Dave Whittle, a very religious man dedicated to starting a smiley-face, feel-good, grass-roots group. To prevent it from becoming a cult or empire, he set up Team OS/2 as a nebulous organization with no leadership. Whittle, perceived as a threat, was endlessly harassed by Microsoft advocates in various on-line forums and was bounced around IBM. His feel-good vision of Team OS/2 began to fade as its membership reached nearly 10,000 members and fragmented. OS/2 failed to meet market expectations and Microsoft did its best to submarine interest in the product by deriding it. Team OS/2 began to get subversive and vigilante-like.

The situation wasn't completely out of control until a recent series of setbacks for OS/2. Ted Salome, one of the top OS/2 mavens, was laid off under dubious circumstances. Ted was the head of another subculture called the I.V. League, a group that promoted OS/2 among independent vendors, and thus the name.

The pro-OS/2 IBMers felt they had to take things into their own hands, lest OS/2 be dumped by the clueless executives. Team OS/2 suddenly emerged as a revolutionary force, Ho Chi Minh style. The touchy-feelie, good-guy attitude was replaced with camouflage face paint and fatigues. Target: Windows 95. Windows 95 gave them the opportunity to take the same potshots at Microsoft that Microsoft took at OS/2.

Microsoft always sensed that something was up with Team OS/2, and reckoned that by spending a ton of money and making a lot of noise, it would drown out Team OS/2 and other Microsoft bashers. Microsoft began to characterize them as "thugs" and then copied the Whittle model to form its Team OS/2 clone. Club Win is their equivalent, which sounds more like a casino.

None of this helps anyone. Team OS/2 is on virtually every forum passing around rumors and outlining flaws in Windows 95. Entire forums, such as Canopus on CompuServe, harp on problems with Windows and Microsoft. On the Internet, an anti-Microsoft campaign is underway in which the signature lines on a lot of e-mail contain a fishy message about how the mailer will sue Microsoft if the contents are posted on MSN. At least one

ex-employee has initiated a grudge page on the World-Wide Web to rant against Bill Gates. The newsgroups *alt.fan.Bill-Gates* or *alt.destroy.microsoft* are loaded with vitriol and smug disdain. The Unofficial Bill Web page (<http://www.zpub.com/un/bill/>) takes this crusade a step further.

Where is this all headed? It's hard to say, but we are witnessing two very large companies and numerous fanatics who have lost sight of the fact that computing is supposed to be fun. I blame Microsoft's win-at-any-cost mentality for this sickening turn of events.



OS/2 failed to meet market expectation as Team OS/2 began to get subversive and vigilante-like.



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Inside Track

Discovering that Intel would dub the P6 the **Pentium Pro** surprised me a little, as I was predicting a **jazzler**, more modern moniker. The term "Pro" harkens back to the 1980s. Remember XTree Pro? What's next? Pentium Turbo? Or how about **Pentium Pro Gold**? Obviously they chose this name in-house at lunch during a Jolt Cola binge.

The **Pentium Pro** still suffers from its pure 32-bit nature and the horrible fact that 95 percent of the applications available are 16-bit and will remain so for years to come. If you missed the reports, the P6 runs most 16-bit apps slower than a Pentium processor at the same clock speed. Sacrifices were made for 32-bit performance, which is stunning but academic for now.

Meanwhile, the competition attacking Intel is going to **get larger**, and Intel's only way out is by hoping its alignment with HP produces a P7 (Pentium Pro Gold?) sooner rather than later. Look for a **new SPARC design** from Ross Technologies to add x86 decoders to the SPARC architecture. It seems that all the RISC guys decided that it won't hurt to **have chip-level x86 compatibility**. DEC is supposedly planning a similar attack with its Alpha chip. As the chip shrinks with a new 0.35-micron process technology, there is no reason not to add such functionality.

Unless Intel does something drastic, this could be a bigger threat than that posed by AMD and Cyrix. The Intel backward-compatible strategy may be its **Achilles heel**. Most software is still coded for the 386. The innards of an Intel chip, no matter how fancy, are essentially those of a glorified 386.

Microsoft Offensive Strategy Dept.: It's amusing to watch how Intel and Microsoft use similar tactics in an attempt to control the direction of the PC industry. Intel builds motherboards and chip sets to lure OEMs into moving to the next generation of microprocessors faster and faster. Microsoft uses a similar strategy. You can always see which direction Microsoft is pushing when it goes into the hardware business. It brings out a mouse, for example, so people can **easily migrate** to the mouse-oriented Windows. It once had an accelerator board so people could make Windows functional. In the 1970s, Microsoft produced a Z-80 card for the Apple II to **cajole people to the CP/M** operating system. The list is rather long.

Anyway, the latest hardware from Microsoft is a game controller designed to keep users away from the **new high-end game machines** such as Sega Saturn and Sony Playstation. These expensive game machines, which

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are essentially following the path of 3DO, can easily be turned into computers. There is no evidence that the game makers are teaming up with Microsoft, so Microsoft is trying to cut them off at the pass. **The complex eight-button controller/joystick is called the Side-winder 3D Pro** (there's that "Pro" again) and will sell for about \$60. I'm sure it will be easier to play a game on this thing when compared to using the radical Microsoft Natural keyboard. Microsoft will also sell a simple two-button joystick for somewhere in the neighborhood of \$30.

Microsoft is not alone in trying to turn the PC into a real game platform. Capcom has recently released **Mega Man X**, which comes **bundled with a Ninten-**

do-like controller that hooks to the PC. According to kids in the know, this game is wonderful and the controller is excellent. Look for it at most computer stores. Can you spell O-U-T-S-T-A-N-D-I-N-G?

Genuinely Interesting Hardware Dept.: Do you have ISDN, and have you discovered that the lack of a standard for B-channel bonding is making it so most of **your connectivity leaves the second B-channel languishing**? Now you can turn that B-channel into a smart analog/digital ISDN voice phone system with the IBM 7845 Network Terminator Extended. Developed in Raleigh and little known, this is a cool box that passes the first B-channel on to your computer system while turning the second B-channel into a **smart phone system**, complete with **every imaginable feature** including **distinctive ringing** for three different phone numbers (most ISDN lines can have 10 assigned phone numbers), three-way or six-way conferencing with Hold and Drop, as well as a number of programmable features. It uses standard analog Touch-tone phones that plug right in. **You can even use it to plug in a network of phones around the house.** It's available from IBM for around \$330. You can kiss those \$1,500 ISDN digital phones good-bye. **Highly recommended.**

Genuinely Interesting Software Dept.: If you're interested in honing your fiction-writing skills and want to sell that novel/play/screenplay (choose one), you should have a look at **John Truby's StoryLine Pro** (yikes, "Pro" again) software. \$295, and worth it. This guy is the best script doctor in the movie industry, and this program makes you tell a good story **whether you want to or not**. A winner. Recently this system was used to develop *Sleepless in Seattle* and *Outbreak*. Call the Truby Writers Studio at 508-440-9078 to get a copy, or send them a fax at 508-443-7286. Truby also has killer audiotapes of his lectures on story telling. Hot stuff. □

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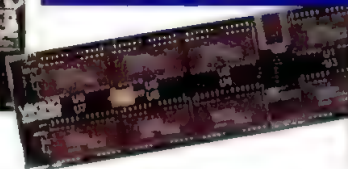
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Jim Seymour

Notebook PCs: Don't Gild the Lily

You can feel underfoot the shifting of the center of gravity of the PC market. As lively as the desktop and server markets are, and as big as the home market has become, the most intense interest, competition, and innovation is found right now in notebook

PCs. And on three big counts—our interest in buying notebooks, the intensity of the competition among notebook makers, and the rate of innovation—it's about to get a lot hotter still.

The notebook market today is really three separate markets. There are notebooks you can buy that lie outside these three areas, but frankly, they don't matter much any more. The three hot areas: high-end "multi-media" notebooks, small and lightweight notebooks (let's lose the confusing term *subnotebooks*), and the newest entrant, value-line notebooks. This isn't a true taxonomy, since it crosses lines—traditional market analyses cluster products along single axes (such as price, weight, or features), but today's notebook market can no longer be defined along a single axis.

A small wave of hot new notebooks in all three areas arrived in late summer; in a couple of weeks we'll see a lot more new entries in Las Vegas, at Comdex.

As much as I like fast, powerful notebooks with big screens, built-in CD-ROM drives, huge hard disks and knockout sound, I'm frankly fascinated by today's value-line machines. Because of their price points—which translate into truly mass markets—these are the machines that will change how many of us use PCs.

In every market, there are "magic" price points—levels at which demand for a product explodes. In notebooks, that magic point is around \$2,000. Corporate PC buyers have been complaining about the price premium for notebooks over desktops for years. At \$2,000 or so, the cost of a notebook no longer seems so out of line for them, and even IS people who have stoutly resisted widespread adoption of notebook computers are lining up to buy them.

All that said, no matter how cheap something may be, if it can't do the job, it's

money wasted. The newest generation of value-line notebooks finally cross that threshold, from wanna-bes to good enough.

Indeed, there are so many value-line machines coming out now that making a smart choice among low-end notebooks has become one of the toughest PC-buying jobs. The biggest problem is not gilding the lily: It's easy to keep upgrading your specs for a low-end machine until you have a \$3,000-plus imitation of a high-end notebook.

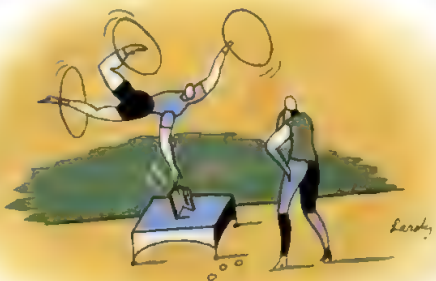
And that's a mistake: If you want a midrange machine, look at midrange machines. Value-line notebooks make the most sense when taken, so to speak, at face value. Don't destroy their economic justification by stuffing them full of expensive parts.

I spent a lot of time this summer and fall sitting around corporate conference tables, working with clients choosing value-line notebooks for large-scale purchases. And I've formed some firm opinions about what makes sense and what doesn't in these machines.

- Get at least a 75-MHz DX4 CPU, and preferably a 100-MHz chip. But forget Pentiums. Pentiums are nice, and by the middle of 1996 they'll be common in low-end notebooks. But for now, value-line notebooks are a DX4 world.

- Get enough memory—8MB at a minimum, perhaps 12MB—but don't try to turn these machines into fire-breathing, RAM-heavy monsters.

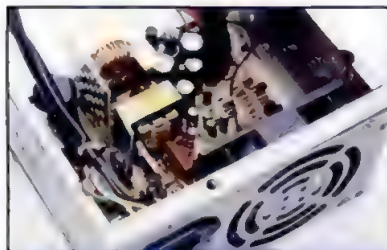
- You don't need an active-matrix display, but you do need color. The new dual-scan color displays are just fine, and cost \$600 to \$700 less than comparable-size active-matrix screens. As former *PC Magazine* editor in chief Bill Machrone points out, the narrower viewing angle of dual-scan displays discourages others from reading your screen in public places. And most



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Jim Seymour

new dual-scan color screens are 10.4-inch displays, while active-matrix units are only 9.4 inches. That makes a *big* difference in legibility.

- Don't skimp on hard disk space. At a minimum you want 340MB, and something around 500MB makes more sense. With 100MB application suites upon us, plus today's storage-hungry operating systems, you'll regret buying a smaller disk.

- Light, small, fast, and cheap don't go together. Most of the better new value-line machines are a little larger and heavier than I'd like them. But engineering and miniaturization costs, in many ways. You're going to have to carry extra stuff in a notebook PC bag, anyway; that extra pound that seems so heavy when you're evaluating machines disappears when you drop the computer into a bag filled with five pounds of other gear.

- Port replicators *si*, docking stations *no*. Small, cheap (\$100) port replicators are perfect matches for these econoboxes; big, clumsy, expensive (\$400 to \$800) deskbound docking stations make little sense.

- Get a good modem or modem/network-card combination. Don't take a dive with a cheap, slow, or off-brand PCMCIA modem or combo modem/network interface card. If you need to communicate, you need reliable connections—period.

- Expect about two years of useful life. High-end notebooks are technologically obsolete after two years; how could low-end machines, on the trailing edge of technology when they're new, escape that curse? Wear and tear is also a big factor to consider in the useful life of notebooks. Notebooks in the \$2,000 zone invariably make some compromises in ruggedness, compared to their \$5,000 siblings. Expect sound construction and reliability. But don't expect miracles.

Among the best of the new value-line machines I've seen: Toshiba's Satellite T2110CT, NEC's Versa 2000, Dell's Latitude LX4100D, Texas Instruments' Extensa 450, MicroElectronic's WinBook XP-100.

By the time you read this, there will be more good choices. All can be had in the neighborhood of \$2,000, or a little more with enough RAM to make them truly useful.

If you or your company has held back on notebook PCs because of cost, now's the time to jump. Value-line notebooks are mainstream PCs in every sense, and the opportunity cost of staying out of the game has just gotten too high. □

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Bill Howard

AT&T Hangs Up Its PCs

Talk about squandering a crown jewel of a name: Ask anyone to name a high-technology company that has been well-known and well respected over the course of decades, and the name AT&T will be at or near the top of the list. Ask them if AT&T

would be a company they'd like to see build a consumer-oriented PC, and they'd say certainly. So what happened?

The decision by AT&T to exit the PC business at the beginning of the fall says something about the nature of the business, but not too much. For AT&T managed to do itself in in some ways that were unique to AT&T. No other PC vendor thought, for instance, that a cool way to tap into the consumer market would be to sell computers through AT&T phone centers. AT&T never went through with this, and it wouldn't have worked anyway.

Here's what you can say about AT&T that pertains to the industry as a whole:

Price/performance is in. Too many AT&T GIS PCs reviewed by *PC Magazine* in the past several years had comparatively high prices and low performance. You can get away with being 10 to 15 percent pricier if you're Compaq, but AT&T wasn't one of the few vendors who had that luxury.

Telephony is a nice little feature, not a big feature. The speakerphone part of AT&T's telephony PCs were the best in the industry, but a) most people assumed they would be, just as you'd expect a PC built by Seiko to keep good time, and b) a speakerphone is yet to be a compelling reason to buy one PC over another. Most users have noticed that a \$99 speakerphone does as good a job as a \$2,500 telephony PC.

There's still money to be lost in digital convergence. The marriage of the computer, the telephone, cable television, cellular, Hollywood, and Nintendo is not a paradigm shift, not yet, at least. AT&T dabbled in that with its telephony PCs, with the Eo personal communicator, and with plans (never hatched) to put second PCs in American dens, PCs that were

combination PC/TV/phone/security systems.

AT&T GIS isn't the only company with problems. I can think of at least half a dozen other companies that have, at the least, the potential to be in trouble with some of their PC operations.

Compaq has been through a period of a year and a half with mediocre portable PCs. I also have trouble understanding how Compaq seems to cut desktop PC prices every month or two, yet it's the vendor that has the most difficulty meeting some of our price filters (set to assure a level playing field for reviews), such as \$2,500 maximum for a decent home PC system.

AST has had trouble holding on to shelf space in computer retail stores, and its spending on R&D has fallen. While half a million PCs a year is nothing to sneeze at, this is the company mentioned most when I ask other vendors which one Hewlett-Packard is likely to edge out for consumer retail space.

Is it bye-bye to **Apple**? The Windows 95 marketing campaign is light on substance, heavy on attitude, but it might just convince the world that Windows is the cool place to be, not the Mac. Apple's "welcome to where we were ten years ago" response ads are funny but beside the point. Most people care about what PCs do today. It's not

beyond the realm of possibility to imagine Apple not surviving beyond the decade. I hope not; Apple keeps Microsoft honest.

So which are the hot companies? **Hewlett-Packard** has few flaws other than an underperforming portables business. But the hottest PC company is **Intel**. You know that Intel makes the CPUs in most PCs, but Intel also manufactures the chip sets, motherboards, and in many cases entire PCs, which are then sold affordably under some other company's name. As AT&T found out, that's pretty stiff competition. □



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Steve Bass, PC WORLD
"Hoc Pidd for the Home
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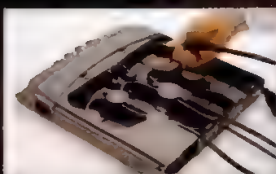
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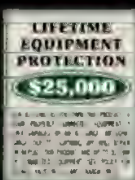
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WORD PROCESSORS: Front & Center

After a couple of sleepy years, word processors are waking up with new features designed to make them the hub around which your computing day revolves, no matter what kind of work you do.

It's no accident that the personal computer looks like a typewriter with a television screen on top. Much of the work that's accomplished at a PC is work that used to be done, a lot more slowly, at a typewriter. Much of the information that you produce is entered, edited, and printed by your word processor. If you don't compose your electronic mail in your word processor now, you'll probably do so in the near future, because new operating systems like Windows 95 make it relatively easy to link a word processor to an e-mail program. Any software that hopes to succeed in the corporate market has to work intimately with all major word processors. Whichever company rules the word processing market effectively rules the market in most other categories of desktop software.

In this cover story, we survey the entire spectrum of today's word processors. We review six full-featured packages for DOS, Windows 3.1, Windows 95, and OS/2 Warp: Clearlook, DeScribe Word Processor, Lotus Word Pro (formerly Ami Pro), Microsoft Word for Windows 95, WordPerfect for Windows, and WordPerfect

for DOS. We also review a smaller-scaled Windows program, WordExpress, and the word processing components of three integrated software packages designed for the SOHO market: Ability for Windows, Microsoft Works for Windows 95, and PerfectWorks (ClarisWorks was between versions at the time of testing). And for a look at some specialized word processors, see the sidebar "Special-Interest Word Processors."

SEPARATE OR TOGETHER

Three of the full-featured programs in this survey are sold as separate products and as components of integrated software suites. Word Pro is part of Lotus's SmartSuite, Microsoft Word is part of Microsoft Office, and WordPerfect for Windows is part of Novell's PerfectOffice. Many leaders in the software industry expect these high-end suites to become more tightly integrated in the way that Microsoft Works and PerfectWorks are now. If their predictions come true, the separate word processor will be replaced by a text-processing module that will be part of a package where all the graphics, table, and mail-

By Edward Mendelson

merge features that are now built into word processors are available only from other modules in the same package.

The first steps in this direction have already occurred. The various components of a single suite now share common elements like spell-checking and file management. PerfectOffice has a macro language that operates across all its applications. SmartSuite will get the same feature in a version that ships later this year, and Microsoft has promised it for a future version of Office.

A WORLD OF DOCUMENTS

Windows 95 and OS/2 Warp are both designed to ease the transition to a world of documents rather than a world of applications. OS/2 with its templates and Windows 95 with its cascading list of file types in its context menus both facilitate creating a new document without thinking first about opening a word processor.

OLE 2.0 lets word processors act as containers for the menus and tools of other kinds of application, and all three software suites support features like drawing and charting through server applications that can be run only from inside large-scale applications like word processors or spreadsheets. The solid borders that once divided different kinds of applications from each other are rapidly becoming porous.

It's possible that word processors will

disappear as a separate category. But it's equally possible that they won't. Word processors have a history of swallowing other types of software instead of being swallowed themselves. Whole categories of software disappeared from the market when word processors began to incorporate their features. Standalone spelling checkers, envelope addressers, outliners, and on-the-fly abbreviation expanders all sold well until word processors started doing the same jobs better.

Standalone editors for creating World-Wide Web pages in HyperText Markup Language (HTML) will probably disappear now that the latest word processors can create HTML files. With Internet access built into Word Pro, a full Internet browser available as a free add-on to Word for Windows, and a telnet communications module built into Nota Bene, separate Web browsers may now begin to disappear. It's far easier to store and use the information you find on the Internet if that data is already in your word processor when you first see it.

EVEN MORE FEATURES

Meanwhile, word processors continue to add more and better features. This is a surprising development, because a few years ago, word processing technology seemed virtually stagnant. Every imaginable feature had been built into increas-

ingly bloated programs that all looked the same. Then Microsoft introduced fully automated formatting in Word for Windows 6.0, with its ability to apply headlines and bulleted lists to plain ASCII text, and the competition suddenly grew heated again. WordPerfect for Windows 6.1 responded with searching for multiple word forms, so you could replace every instance of *buy*, *bought*, and other forms of the same word with the matching forms of *purchase* in a single operation.

Earlier this year, Lotus shook up the market by introducing Word Pro, the first word processor that can store different versions of a document in the same file, and the first program in years to make significant improvements to the standard word processor GUI. Word Pro's tabbed document sections drastically ease the work of navigating and organizing complex documents. The work of formatting is simplified by Word Pro's InfoBox, a tabbed dialog box that contains all controls over a document's layout. Changes made in the InfoBox appear instantly in the file, so you no longer need to reopen the same dialog repeatedly to get the results you want.

Another advance is found not only in word processors but in all new software written to be part of software suites. Natural-language help systems, in which you get help by typing in a question, appeared almost simultaneously in Word Pro and in

HIGHLIGHTS

Word Processors

Not so long ago, much of our writing, editing, and printing was handled (quite slowly) by our good friend the typewriter. Those days, however, have been relegated to history as word processors have become more widespread and more advanced, doing the job both better and faster.

SWALLOWING UP other markets has long been a hallmark of word processing programs. Standalone spell-checkers, addressers, and outliners have been absorbed into word processors and become standard features. Web browsers may be the next to go. As Internet access becomes folded into operating systems, storing

the information via your word processor begins to make sense.

FEATURES WARS are far from over on the word processing front. Some of the major advances this year include fully automated formatting, the ability to search for multiple word forms, easy and logical storage of different versions of a document, and natural-language help systems. Development in all of these areas will undoubtedly escalate.

DIFFERENT APPROACHES to what a document is in terms of underlying structure are another idiosyncrasy of the word processing market.

Though all of the packages are comparable in terms of editing features, the differences in how each manages documents are becoming more dramatic. Increased flexibility in document management is the trend that's easiest to spot.

ENHANCED INTEGRATION with the operating system is yet another expanding area in word processors, particularly with the release of Windows 95. Obviously, Microsoft Word for Windows is the most tightly integrated with the new OS, but Novell is planning to bring WordPerfect to the same level of integration in the near future.

the newly released Microsoft Word for Windows 95, as well as in the rest of the Microsoft Office suite. The same feature will be built into the rest of SmartSuite, and will appear early in 1996 in WordPerfect and the rest of PerfectOffice.

DIFFERENT METAPHORS

All word processors rely on different underlying metaphors for organizing documents, and all make different assumptions about the best way to view a document while you work. WordPerfect, the word processor with the longest history, still reflects its original design goal, which was to make 1980-vintage computers as easy to use as a typewriter. Even the most elaborate WordPerfect document today is still essentially a plain text file with formatting added, and WordPerfect is easiest to work with when it displays files as a continuous flow of text.

Microsoft Word for Windows, by contrast, has always assumed that documents have a structure, and that the structural units of a document are paragraphs and sections that each have their own special format. Although Microsoft no longer emphasizes stylesheets, the paragraph-and-section structure of a stylesheet underlies every Word file, and the most informative Word screen display is a variation on the normal view that shows the style name of each paragraph in a column on the left of the text.

Word Pro introduced the first new document-organizing metaphor since Word introduced the stylesheet in 1983. In Word Pro a document is divided into sections that can be subdivided, recombined, and rearranged simply by dragging tabs that optionally display at the top of the editing window. This kind of structure is far more flexible than the comparatively rigid structures in Word, and Word Pro's default screen is designed to make clear how easy it is to manipulate the structure of a document created in the program.

Metaphors can be misleading. Although WordPerfect's documents have the least complex underlying structure, WordPerfect's handling of complex

Microsoft Word for Windows 95 WordPerfect 6.1 for Windows WordPerfect 6.1 for DOS

We're currently living through a time of transition in operating systems. And though that causes some inevitable uncertainty, word processor users can rest as-

sured that they have good choices no matter which OS they use.

The 32-bit Microsoft Word for Windows 95 is an evolutionary rather than revolutionary upgrade, but its new conveniences—spell-checking on the fly, automated formatting, excellent Wizard-style dialogs to help you through common tasks, and tight integration with the Office suite and Windows 95's Exchange (you can now use Word as your e-mail editor)—are all great attributes.

Word for Windows 95's file format hasn't changed, so it can be used alongside Word for Windows 6.0 in your organization. Word 6.0, our last Editors' Choice, remains a great product and hasn't gone away.

If, however, you need some of the very high-end word processing features that only WordPerfect 6.1 for Windows provides (its unrivaled support for paragraph and outline numbering, for example), you shouldn't hesitate to use it with Windows 95, even though it's a 16-bit application.

If you're a Windows 3.x user, you'll be best served by WordPerfect 6.1 for Windows. Its publishing power is vast, extending beyond text into number crunching and graphics. No word

processor has better file management: WordPerfect's QuickList and Quick-Finder features give you lightning-fast access to any text. If this version of the product is any indication, the upcoming Windows 95 version should be a stunner.

Die-hard DOS word processing users have few choices these days, but as long WordPerfect 6.1 for DOS hangs around, they'll have at least one good program to use. Fast and clean, the package has both text and graphics modes. Its font support is amazing, and automated templates are surprisingly easy to build. You'll miss out on some of the features of the Windows version, but not as many as you might think.

Though Lotus Word Pro doesn't yet earn an Editors' Choice, it certainly deserved a nod as Most Improved. Remnants of the old Ami Pro remain, but Lotus's emphasis on team computing has led to a program chock-full of innovations for group collaboration. Versioning, routing, and group editing have never been easier, and the "groupability" features you see in Word Pro are being echoed in the other components of Lotus's SmartSuite as well.

OPERATING WITHIN THE SYSTEM

As you would expect from a Microsoft product, Word for Windows offers the tightest integration with Windows 95, although Novell promises comparably tight integration for the forthcoming Windows 95 version of WordPerfect. Word optionally serves as the editor for the Microsoft Exchange client, and its help menu includes an item that takes you directly to the Word forum on The Microsoft Network.

Other vendors will inevitably lag be-



Our Contributors: EDWARD MENDELSON is a contributing editor and BEN Z. GOTTESMAN is a technical director at *PC Magazine*. DON WILLMOTT was the executive editor in charge of this story, and DAN SMITH was the project leader.

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hind in integration with Windows, although they lead Microsoft in many other aspects of software-suite integration. And Lotus's Word Pro of course enjoys the tightest integration with Lotus Notes.

The two OS/2 word processors, Clearlook and DeScribe, use OS/2 templates as their main means of integration with the Workplace Shell, and graphics files can be dragged directly from the OS/2 desktop for import into DeScribe. Now that Lotus is owned by IBM, you can expect the forthcoming OS/2 version of Word Pro and the rest of SmartSuite to take special advantage of its operating system.

The older technology of DOS doesn't permit such extensive integration, but WordPerfect for DOS comes with a beautifully designed, feature-rich task switcher and shell program that lets you cut and paste data between WordPerfect and other character-based DOS applications, and which supports macros that operate across applications. It takes DOS as far as it can go.

Word processors may have an uncertain future as a software category, but as our reviews and PC Labs' tests demonstrate, they are thriving and improving in ways that were scarcely imaginable a few years ago.

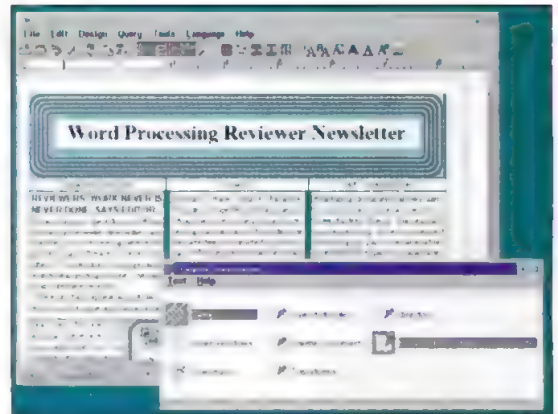
Clearlook Corp.

Clearlook

ALL REVIEWS BY EDWARD MENDELSON

Like many other native OS/2 applications, Clearlook 1.5 looks and acts different from other programs of its kind. This low-frills \$169 word processor from Clearlook Corp. uses terminology and procedures you won't find elsewhere, and if its limited feature set doesn't impress you, at least you have to admire its originality.

You won't find paragraph numbering, macros, or extensive import/export options in Clearlook 1.5, nor will you find standard features like automatic indenting of the first line of a paragraph. And you may have to call tech support before you can print an envelope. But writers of software documentation will like the feature that captures part or all of the screen and inserts it on the page with a mouse click, and everyone else will like the program's speed and compact size. It's one of the few graphical word processors that occupy less than 3MB of disk space.



Clearlook divides pages into cells that resemble standard word processing frames. The status window at the lower right is the point of access for option settings and editing windows.

STRAIGHTFORWARD APPROACH

Some of Clearlook's features are refreshingly straightforward. To change page margins, just click and drag the frame that surrounds the page. If you want to change the font size, click on a toolbar icon and drag a slider to the point size you want. Other features are bafflingly obscure, however, like a Transforms menu item that controls indexes, tables of contents, mail-merge, and envelope creation.

WORD PROCESSORS

Suitability to Task

SUITABILITY TO TASK

Product name

	Power	Ease
Formatting/layout	Poor	Poor
Composing/editing text	Fair	Fair
File management	Good	Good
User automation	Good	Good
Collaboration	Good	Good
Advanced	Excellent	Excellent

The **formatting/layout** task involves the program's ability to shape the content of a document through all kinds of page layout features.

The **composing/editing text** task involves the tools for adding and modifying text within a document.

The **file management** task involves the program's ability to help you easily locate files and store them in an efficient manner.

The **user automation** task involves the tools you can use to make creating documents easier. We look at the selection of templates the program provides and the ability to modify them or create new ones. We also look at the sophistication of recorded scripts and the program's mail-merge.

Suitability to task scores reflect how well a product fares for a particular type of application.

Ease represents the ease of learning and ease of use of the features that are present for a given task.

Power represents the breadth of features available for a given task.

The **collaboration** task involves the tools the program gives you to help you work with others. This task starts with basic features such as the ability to route documents via mail and to use the program as a rich-text mail editor. We also look at group editing features such as the ability to track revisions, place comments within documents, and consolidate.

For the **advanced** task, we examine how much power you get to customize and enhance the product. We look at the full programming strength of the macro language and the ability to customize keyboards and menus. We also look at additional tools provided with the program, including drawing and imaging tools.

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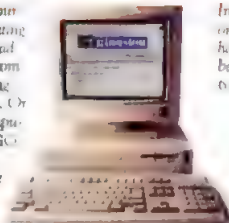


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Special-Interest Word Processors

By Edward Mendelson

Most of today's word processors try to be all things to all users, which means that many users with specialized needs won't be satisfied with any of them. Here are five word processing packages designed specifically for multilingual use, for low-powered computers, or specifically for text entry with few or no graphics features.

ACCENT PROFESSIONAL

Accent Professional is the multilingual word processor that adapts itself most thoroughly to multilingual users. Accent Software International's \$399 Windows-based package includes basic word processing features—you get columns, tables, and mail-merge but no footnotes—and displays its menus in any of 20 languages and its help files in any of 11. Text can be entered in over 30 languages based on any of 7 alphabets for Western and Eastern European languages, Arabic, Cyrillic, Greek, Hebrew, and Turkish. Built-in spell-checking supports 17 languages, with dictionary-based hyphenation for 14. Among 150 fonts in the package, most are superb Bitstream designs.

Accent's interface is based on the standard established by Word for Windows, with toolbar, formatting ribbon, ruler, and status line around a zoomable

editing window that can switch from WYSIWYG to draft mode. The major change in the standard interface is the addition of a language drop-down menu. When you select a language, the keyboard layout and font change automatically. If you switch to and from Arabic or Hebrew, the direction of text entry changes from left-to-right to right-to-left.

The program handles direction changes transparently, but it includes a full set of manual controls over details such as the direction of numbers and punctuation. The insert cursor has a pointer indicating the current direction.

Everything in the package works smoothly and quickly, and feels tightly integrated with Windows. Two reduced versions, the \$199 Accent Special Edition and the \$69 Accent Express, support text entry and menus in the same number of languages as the Professional version, but have fewer polyglot spelling tools and help files. Contact Accent Software International at 800-535-5256.

NOTA BENE

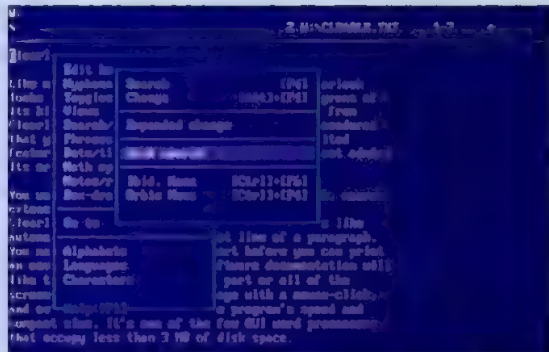
Nota Bene, a \$249 DOS-based package from a company of the same name, presents itself as the word processor for ambitious scholars. But it's also the fastest, most efficient program on the market for entering and editing text, from biblical scholarship to romantic novels. Many full-time writers will find it superior to any Windows package.

The keyboard layout—including the number pad—is dedicated entirely to editing keys. Single keystrokes can delete or transpose words, sentences, or paragraphs. Other keystrokes simultaneously scroll the text in two windows, a feat

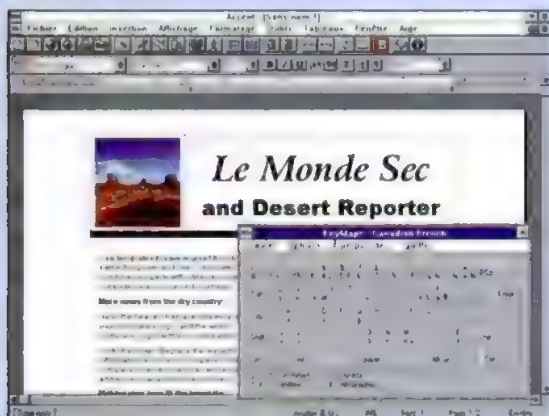
that no other word processor can perform at all.

The program searches at lightning speed through disk files, and an add-on "textbase" indexing module, included in the package, is even more tightly integrated than WordPerfect's Quick-Finder. The interface uses a command line that remembers previous commands and a menu system that doesn't conform to CUA interface standards.

The basic package includes a bibliographical citation database that supports all standard publication formats. The \$349 *Lingua* version adds full support in all modules for Eastern Euro-



Nota Bene is known for its speed, not for its good looks. This DOS-based word processor is widely used among academics who appreciate its bibliographic features.



Accent is among the most successfully implemented multilingual word processors. Included in the package are 150 fonts and support for spell-checking in 17 languages.

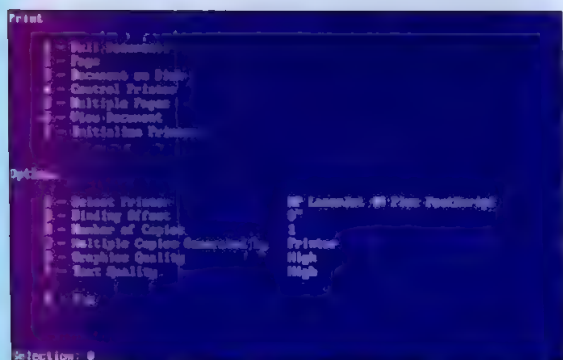
pean, classical Greek, biblical Hebrew, and Russian alphabets. Nota Bene isn't for everyone, but speed demons who learn to appreciate its vast powers won't be happy using any other word processor.

Contact Nota Bene at 800-462-6733 or 212-334-0445.

WORDPERFECT 5.1+

WordPerfect 5.1+ for DOS is designed for the thousands of offices still standardized on WordPerfect 5.x and the many small-computer users who want up-to-date DOS-based word processing on older and slower hardware.

Novell's \$395 package (upgrade price \$50) retains the unique balance of clarity and power that allowed WordPerfect 5.1 to dominate its market, and



WordPerfect 5.1+ still exists and is most useful on slower and older DOS-based PCs. It imports and exports WordPerfect 6.1 files easily.

adds integrated fax support and the ability to send e-mail via the DOS GroupWise client. Bitstream FaceLift, a TSR add-on that comes in the package, adds scalable font support with almost any printer. Files from WordPerfect 6.x are imported and exported transparently.

This classic version of WordPerfect offers much of the power of later versions, with graphics print preview but no graphics-based editing interface. Text editing is fast and flexible, and large documents are handled with ease. Tables and imported graphics, while more awkward than in GUI programs, are managed with a minimum of labor on your part.

Contact Novell Inc. at 800-451-5151 or 801-225-5000.

THE UNIVERSAL WORD

WYSIWYG Corp.'s \$49 The Universal Word includes fonts and keyboard layouts for 37 languages. This Windows-based package supports Western and Eastern European character sets, plus Cyrillic, Greek, and Turkish. Other versions, priced up to \$299, add dozens of character sets, including Arabic, Hebrew, Hindi, Lao, Punjabi, Thai, Urdu, Vietnamese, and others. Languages that use

right-to-left input are supported transparently, and behind-the-scenes font management allows unusually extensive character sets in Arabic.

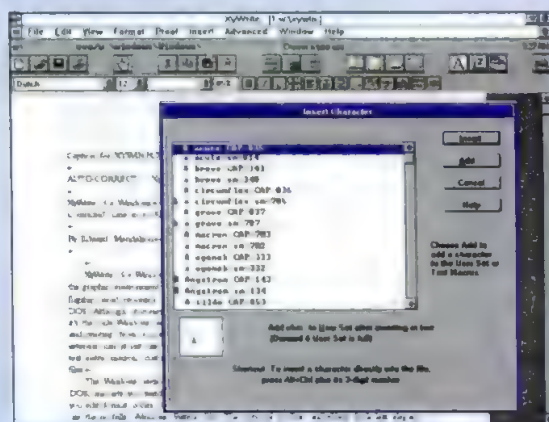
Most standard word processing features are supported, including footnotes and mail-merge but no tables or columns. The interface uses multiple customizable toolbars, and the editing screen is a zoomable draft mode that optionally displays headers, footnotes, and footers. An uneditable print preview displays a full-page or facing-page view. Fonts, keyboard layouts, and input direction change when you select a

English-only version for a \$10 shipping charge.

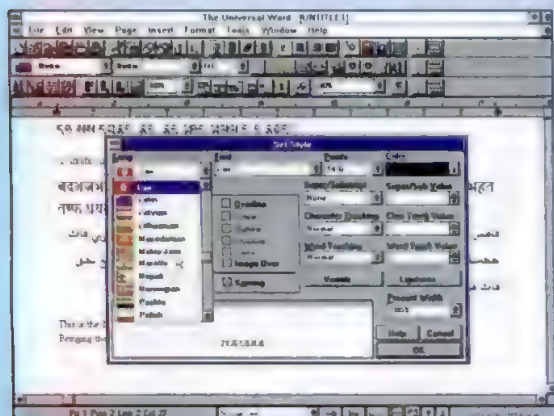
Contact WYSIWYG Corp. at 800-489-9673 or 310-575-1991.

XYWRITE FOR WINDOWS

XyWrite's Windows version is designed for loyalists of the long-established DOS word processor. This \$495 package from The Technology Group won't win any prizes for screen design, but it's the only Windows word processor with an optional command line interface for high-speed editing. Users who switch from the DOS version won't need to learn a new interface, because virtually all the old commands work in exactly the same way.



The Windows version of XyWrite (the fast DOS-based word processor) isn't state of the art, but it does include a command line for fast, mouse-hating typists.



With support for an amazing 37 languages, The Universal Word lets you mix diverse character sets in the same document. Other languages can be ordered as modules.

new language, and keyboard layouts can be customized.

An English spell-checker and thesaurus come with all versions of the package; dictionaries for 21 European languages can be ordered at \$29 each. The program's bundled fonts aren't quite as well designed as the best ones in Accent Professional, but they cover a uniquely broad range of languages. Separate modules, not tested by *PC Magazine*, support Chinese and Japanese. WYSIWYG Corp. is offering 100,000 copies of the

Although XyWrite can use standard Windows fonts, it works best with the Bitstream Speedo fonts that come in the package. Each of these fonts includes over 500 characters, and the program supports even more if your printer supports them.

Graphics and other import/export features are included but operate so awkwardly that you should probably ignore them. Use this program to create an island of ultrafast text editing in the more leisurely graphics-based world of Windows—and consider buying it only if you're already using XyWrite for DOS, which is also still available for \$495. Contact The Technology Group at 410-576-2040.

Clearlook lets you view your document only in full WYSIWYG view. You can tell the program not to display the blank page margins, but headers and footers are always visible and inevitably distracting when you edit near the top or bottom of the page. Unlike DeScribe, Microsoft Word for Windows, and Lotus Word Pro, Clearlook won't let you edit different

SUITABILITY TO TASK

Clearlook

	Power	Ease
Formatting/layout	Fair	Fair
Composing/editing text	Fair	Fair
File management	Fair	Fair
User automation	Poor	Fair
Collaboration	N/A	N/A
Advanced	N/A	N/A

parts of the same document at the same time, although it can display other parts of your file in read-only windows.

Clearlook is subtitled "The Cellular Word Processor," which means that, as in DeScribe, Word Pro, and many desktop publishing packages, everything on the page is enclosed in a frame or, as Clearlook calls it, a *cell*. The basic page is a cell, for example. If you want to add a box anywhere on the page for a "callout," you choose New Text Area from the right-click pop-up menu, and the program inserts another cell—a box surrounded by a nonprinting blue border.

Confusingly, the blue nonprinting top and bottom borders of the box extend across the page to the left and right margins, giving the screen a checkerboard appearance, although you can turn off the blue lines and other markings. The only graphics format you can import is .BMP, but you can also paste graphics from the Clipboard, or through Clearlook's unique built-in screen capture.

Formatting features include named styles, but these are essentially character styles that control text formatting and line spacing. Headings can't be forced to remain on the same page with the paragraphs that follow, and if you want the first line of each paragraph indented, you have to set up a tab stop and press the tab key when you begin a paragraph.

Mail-merge is reasonably straightforward—but no match for the advanced, automated systems in Windows packages. The style feature lets you assign a data-

field value like "First Name" or "Address" to any selected text. The program comes with a built-in selection of field names to choose from, and you can add custom names via a setup menu.

Clearlook is worth considering if you need a basic word processor and demand native OS/2 software. If you can spare the disk space and have more demanding requirements, you may be better served by DeScribe or the forthcoming OS/2 version of Word Pro.

Clearlook 1.5. List price: \$169. Requires: OS/2 2.0 or later, 3MB hard disk space. Clearlook Corp., 1465 41st St., #9, Moline, IL 61265; 800-818-5665, 309-764-2060; fax, 309-764-2086; e-mail, clrlook@ibm.net.

Circle 474 on reader service card

DeScribe Inc.

DeScribe Word Processor

Packing exceptional power, flexibility, and speed in the confines of a sometimes awkward interface is DeScribe Word Processor, the bargain-priced \$49.95 OS/2 word processor from DeScribe Inc. It includes desktop publishing features such as text that flows between frames on widely separated pages, an option that adjusts the on-screen ruler to match real-world measurements, and elaborate controls over letter and word spacing.

It also offers unique conveniences like an unlimited Undo that uses a slider to redisplay all earlier states of your file during the current session, plus a Replace feature that searches and replaces two strings at the same time. In range and flexibility, DeScribe often surpasses anything found in recent Windows word processors, but its menus and toolbars lack the clarity and consistency of the best packages.

DeScribe is primarily an OS/2 program, but its Voyager Package—a thick manual with a CD-ROM inside, which you can find even in bookstores—includes two matching versions for Windows, one for Windows 3.1x, the other for Windows NT 3.51 and Windows 95. We tested the OS/2 version, which boasts

tight integration with the operating system in ways that the Windows versions don't. The OS/2 version, for example, lets you drag graphics files from the desktop into the word processor, and its macros can include simple commands in OS/2's batch language REXX. But all three versions have the same basic editing and formatting features.

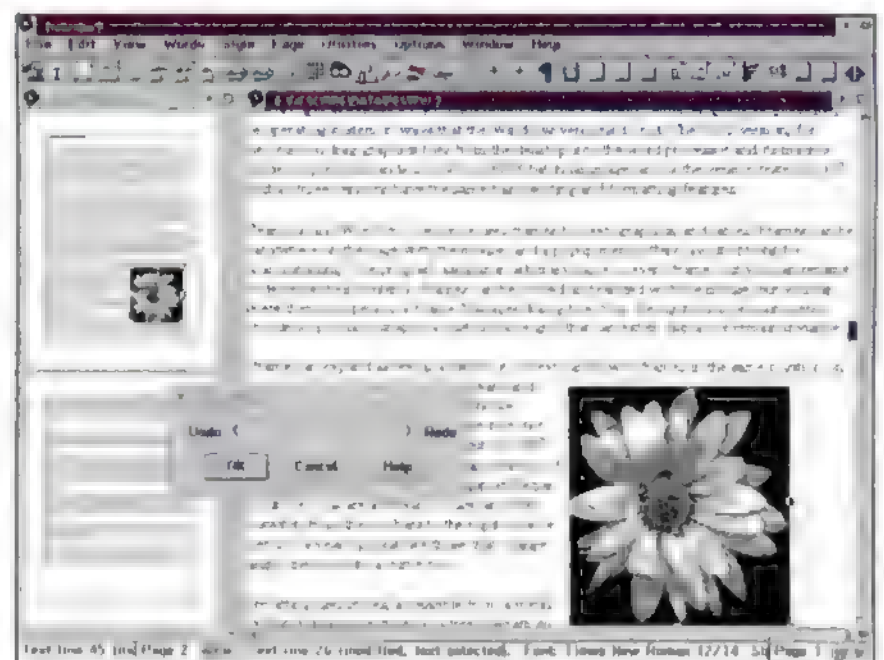
FRAMING YOUR WORDS

Like Clearlook and Word Pro, DeScribe uses frames for text, graphics, and tables. Frames can be drawn anywhere on the page with the mouse, and a pop-up menu offers layout options for borders and shading. The program assigns an arbitrary name to every frame, but you can rename frames to describe their contents. Frames can be moved and resized with the mouse, but you can delete them only by opening a Frame Manager dialog box from the right-click or main menu.

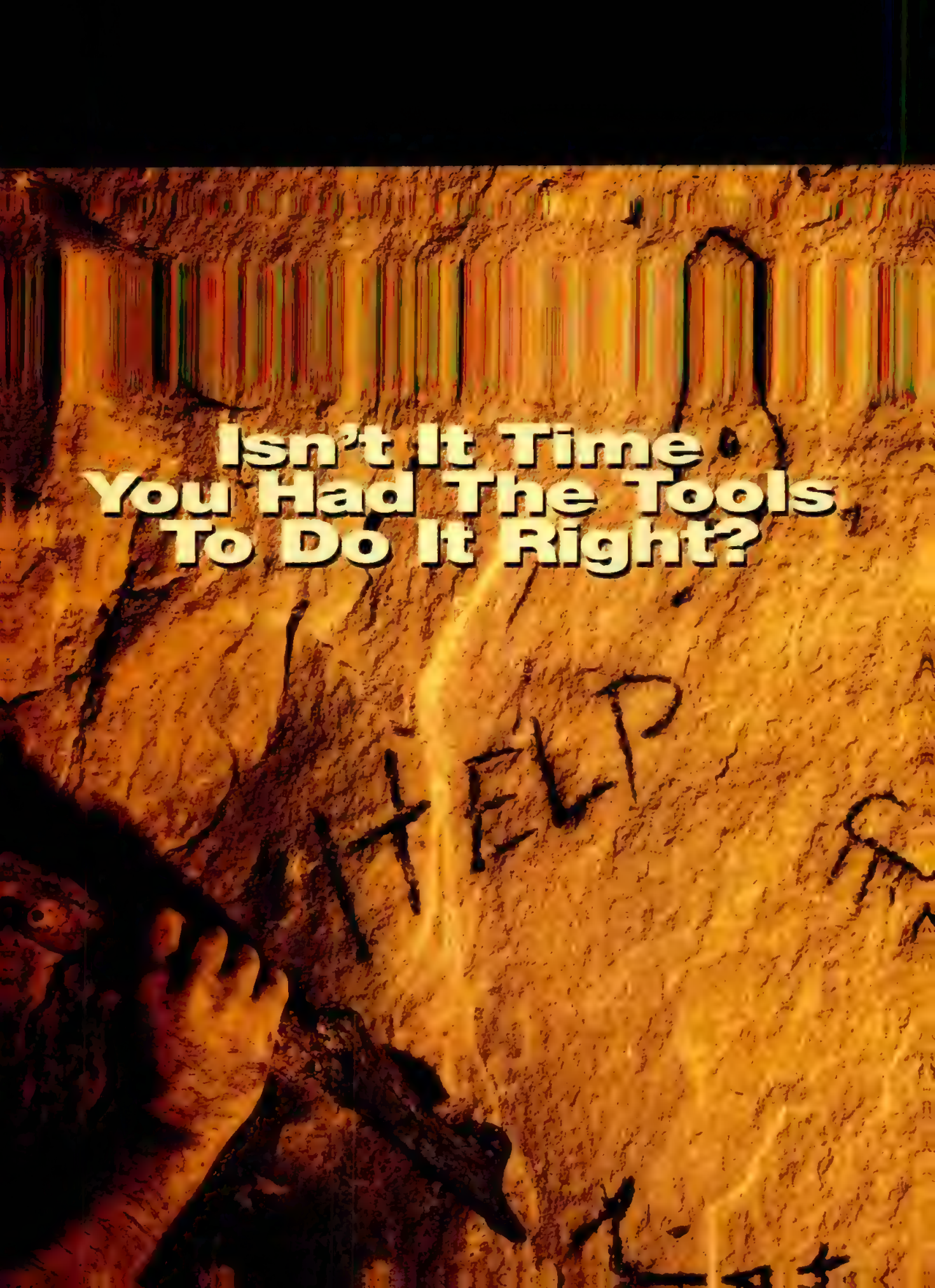
A text frame can expand as text is added to it, or text can flow to frames in the same position on later pages—or it can flow arbitrarily forward and backward in the file to any frame you choose. Outside the frame, text flows only on one side, not both. Most standard graphics formats (but not .GIF) can be imported; the filter rejects many flavors of TIFF files. Built-in drawing functions support Bezier curves, but the tools are awkward to use.

TEXT FORMATTING

Text formatting uses styles, accessible from a menu or a box that displays the styles in a tree diagram so you can see at a



DeScribe Word Processor's Undo dialog box uses a slider to redisplay earlier states of a file. Different parts of a file can be viewed at different zoom levels in multiple windows.

A dramatic, low-key photograph of a person's hand and forearm, holding a piece of dark, charred wood against a rough, textured wall. The wall is a warm, golden-brown color, and the word "HELP" is written in large, dark, hand-drawn letters. The lighting is harsh, creating strong shadows and highlights, emphasizing the textures of the skin, wood, and wall. The overall mood is one of desperation and struggle.

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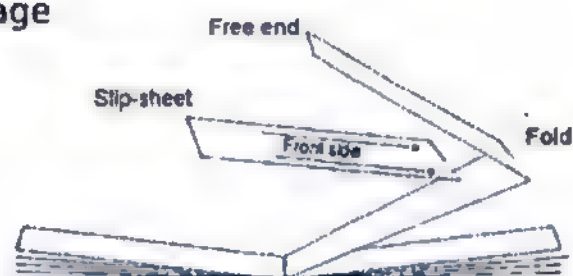
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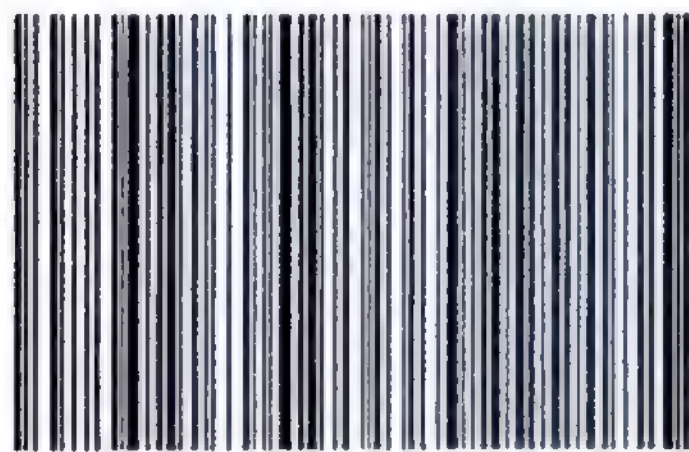
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1. Open the foldout page
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Foldout slip-sheet



GbsSlipSheet-001

Folded edge of the page

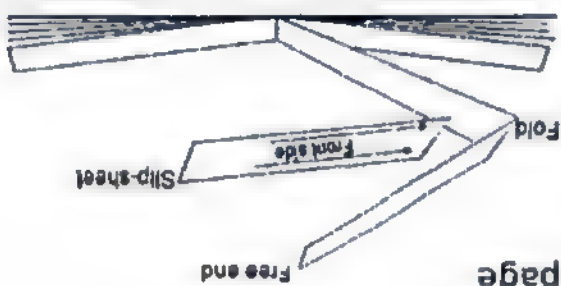
Inverted Foldout slip-sheet

1. Open the foldout page
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1. Front side touching the free page
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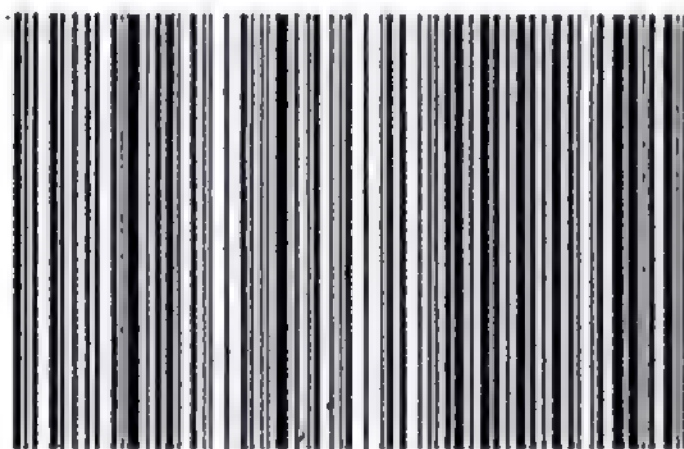
3. Slice the folded edge

4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSilpBack-001B

Back

1. Follow instructions on the other side

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in small power supplies of 150 watts or less! That's great for reducing *their* costs, but it sure doesn't do much for *you*. Pantera power supplies are 200 watts *standard* and

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The Benefits of Collaboration

By Ben Z. Gottesman and
Edward Mendelson

Install one of today's word processors on a network and stop the tedious process of printing out files for your coworkers' comments and then copying their changes into your original. This year's new versions, especially those from Lotus and Microsoft, bring networked team revision closer to the convenience and transparency that users need.

TeamReview can distribute files via e-mail, the network, or floppy disk. Revisions are marked using color, italics, and **strikethrough**. Comments appear as sticky notes marked with the user's initials, and are displayed as icons that obscure a few letters of the underlying text. A built-in highlighter can add emphasis.

Once all the changes have been made to a document, Team-

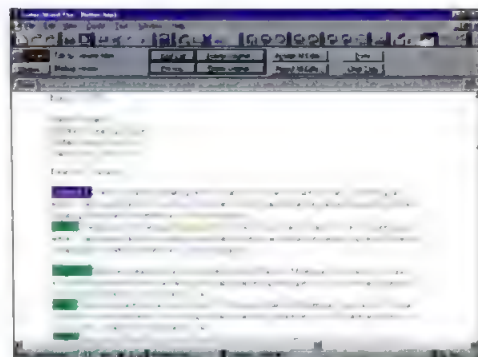
Consolidate integrates all the versions into a single document and lets the editor of the file select which ones to keep.

Using the product's new versioning capabilities, multiple versions of a document can be stored within a single file. Each user can add remarks to explain why a new version was made.

MICROSOFT WORD FOR WINDOWS 95 Word shares some of the workgroup features of Word Pro, although they are less developed. The program can send and route mail using VIM or MAPI. The new WordMail feature lets Word serve as the editor in the mail client Microsoft Exchange in Windows 95. When routing, the user can decide whether changes should be marked as revisions, or whether only annotations will be allowed.

Rights can't be set on a user-by-user basis, and documents can be sent only via e-mail.

Like Word Pro, Word supports revision marks on the fly, and each user's changes appear in a different color. Word's Compare feature looks at only two versions of a document, but it can add revision marks from multiple users sequentially. Word's Annotation feature tracks comments

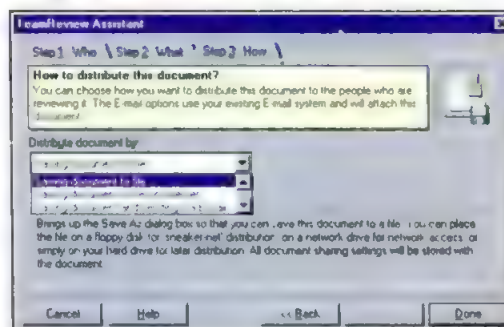


A Word Pro document edited by several people shows each person's edits so that the overall editor can select which edits to keep and which to discard.

from multiple users.

WORDPERFECT FOR WINDOWS

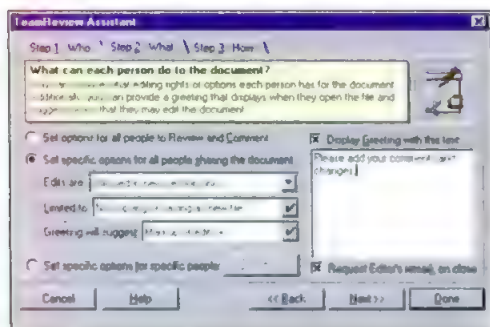
The latest version of WordPerfect for Windows is many months older than the latest versions of its rivals, and its workgroup features are the sparsest. The program supports MAPI and VIM for sending e-mail, but it doesn't support routing documents among users in sequence. WordPerfect is, however, tightly integrated with Novell's groupware product,



People working together on a Word Pro document can choose from among several methods to distribute around the workgroup.

GroupWise, which includes a routing feature.

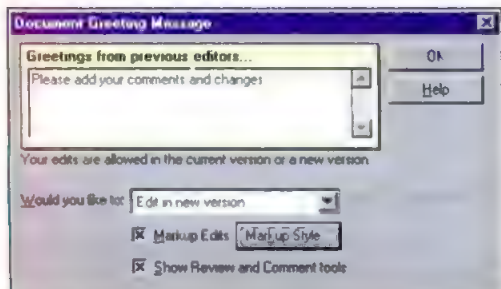
WordPerfect can compare multiple versions of documents, but the program won't be able to add revision marks on the fly until the next version. Users can add comments to the document, which appear as icons in the left margin.



Step 1 in Lotus Word Pro's TeamReview Process is to set up the rights that each editor will be given as he or she looks over the document in question.

LOTUS WORD PRO

Lotus has made a specialty of what it calls Team Computing; as a result, Word Pro offers the easiest and most extensive use of group editing features of the pack. At the heart of Word Pro's workgroup features is the TeamReview dialog box, where a user can decide who can access a document and whether specific users can make changes or only comments.



Group editors who receive a Word Pro document to work on are greeted with a message informing them of the rights they've been given to alter the document.

Bringing back that great, fresh image has simply never been simpler.

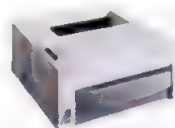


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glance which styles inherit the characteristics of other styles. Documents can include both footnotes and endnotes, and simple, efficient procedures build indexes and tables of contents. Templates support automated fill-in prompts, and envelopes include bar codes but don't automatically capture the address from a letter.

DeScribe includes sticky notes, on-the-fly redlining, outlines, and a confusingly implemented master document feature, but no automatic cross-references. DeScribe is the only OS/2 word processor that supports typographic quotation marks, and it performs complex behind-the-scenes tricks with code pages to do so.

DeScribe's WYSIWYG display lets

software can only envy.

DeScribe Word Processor. List price: \$49.95. Requires: OS/2 2.11 or later (Windows versions require Microsoft Windows 3.x or later, Windows NT, or Windows 95), 2MB to 4MB RAM, 4MB to 22MB hard disk space. DeScribe Inc., 4820 Bayshore Dr., Suite D, Naples, FL 33962; 813-732-5500; fax, 813-732-5414.

Circle 475 on reader service card

Lotus Development Corp.

Lotus Word Pro 96 Edition for Windows 3.1

Lotus Word Pro 96 Edition for Windows 3.1 is the most spectacular advance in the word processing state of the art since the first Windows word processors appeared five years ago. Lotus's successor to the aging Ami Pro 3.x has been released

SUITABILITY TO TASK

DeScribe Word Processor

	Power	Ease
Formatting/layout	Excellent	Good
Composing/editing text	Excellent	Good
File management	Fair	Good
User automation	Good	Fair
Collaboration	Poor	Fair
Advanced	Good	Good

you work on different parts of the same file in multiple windows, as in Word and Word Pro, and like Word Pro, it lets you use different zoom levels in each window.

Seven clumsily drawn toolbars come in the package; they and the menus are both easily customized. The only way to remap the keyboard is by recording or scripting macros and assigning them to keys. Surprisingly, neither the default keyboard nor the built-in macro functions include a one-step operation for deleting a word, and the only way to delete a word with a keystroke is by creating a complex and unintuitive macro.

Mail-merge uses the familiar hand-holding menu-driven system from Windows programs. Tables include simple arithmetic but no dynamic recalculations. DeScribe can expand abbreviations and correct spelling as you type, and its spell-checker optionally displays a full list of a file's misspelled words and proper nouns so you can correct them all at once (even by just dragging and dropping).

Despite some rough patches, DeScribe brings to OS/2 word processing virtually the full range of features and conveniences Windows users take for granted—and at a price that buyers of Windows

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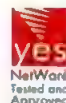
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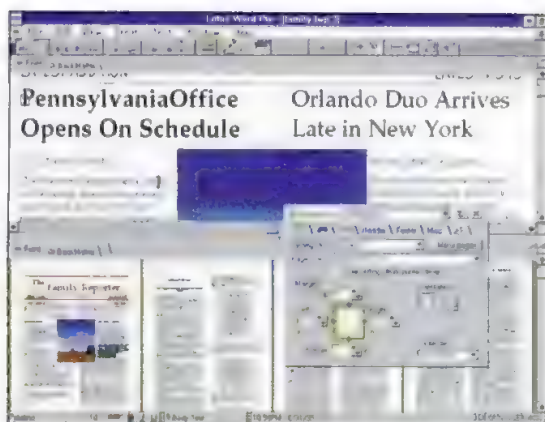
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CIRCLE 201 ON READER SERVICE CARD



Word Pro's preselected multiple views, tabbed document dividers, and one-stop formatting InfoBox are some of the innovative features of this newly introduced program.

first in a 16-bit version for Windows 3.1 or later, with a price of \$105.

Word Pro includes group-editing, audit-trail, automated-template, Internet, and complex-document features that other packages have scarcely begun to dream about. This first release of Word Pro lacks stability, though, so proceed with caution while Lotus works on fixes.

MULTIPLE-VERSION SUPPORT

The program's most innovative feature is its support for multiple versions and multiple authorship. Like DeScribe and Microsoft Word, Word Pro supports on-the-fly revision markings, but it also goes far beyond this feature. You can save the current state of a document at any time as a named version. You can save as many versions as you choose or tell the program to create versions automatically each day or week, or whenever the file is opened.

Workgroup and security features are closely linked to versioning. Files can be set up so that only specified users have rights to edit the current version of a file, create a new version, or print or export any version. Workgroup members can highlight text or create color-coded sticky notes.

At any point in the editing process, multiple versions can be consolidated using a well-designed toolbar, although

the program forces you to save multiple versions to separate files before consolidating them. No other word processor creates such a complete and reliable a document audit trail.

INTERFACE INNOVATIONS

Word Pro's interface includes major innovations in the standard Windows word processor design—as well as a remarkably uncluttered menu structure. Divisions within files are displayed in the form of tabbed dividers at the top of the screen. Each division can contain tabbed subdivisions, and divisions can be reshuffled merely by dragging the tabs. Divisions can also serve as containers for OLE 2.0 objects.

SUITABILITY TO TASK		
Lotus Word Pro 96 Edition for Windows 3.1		
	Power	Ease
Formatting/layout	Excellent	Good
Composing/editing text	Excellent	Good
File management	Fair	Good
User automation	Excellent	Excellent
Collaboration	Excellent	Good
Advanced	Excellent	Good



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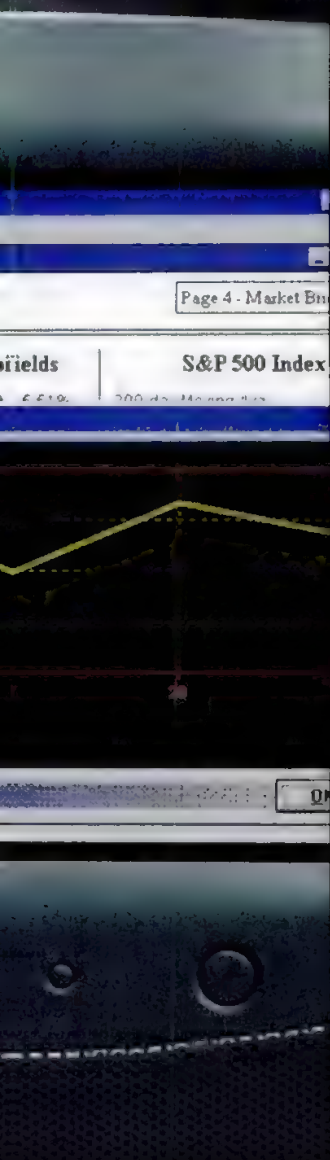
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You still hear people pine for their fast DOS applications, and when we looked at WordPerfect's latest DOS version, 6.1, we got a little nostalgic ourselves. In general, the program proved to be the fastest of the group, either with its old-fashioned character interface or with its proprietary graphical interface.

What the Numbers Mean

Unfortunately, word processors running under the new breed of 32-bit operating systems didn't fare as well as 16-bit DOS or Windows apps on our tests. Windows 95 doubled application load time, although the penalty on other operations was much smaller. OS/2-based Clearlook and DeScribe stumbled on Print and Application Load tests. Our 8-page-per-minute LaserJet III was able to maintain top speed under DOS and Windows but was dragged down to 2 pages per minute under OS/2, most likely because of an inefficient printer driver. Aside from those two tests, though, we were impressed with DeScribe's speed under both Windows 3.1 and OS/2 Warp.

In the past we've been satisfied with the performance of Lotus's Ami Pro, but this year we were generally disappointed with the speed of the new Word Pro. Lotus plans an interim release before the end of the year that will, in part, address this issue.

How We Tested

In this evaluation, we tested all the products on IBM ValuePoint 466 DX2/DP PCs with 360MB IDE hard disks. We configured each system with 8MB RAM and an S3 video card at 800-by-600 resolution with 256 colors. We used an HP LaserJet III with 3MB of memory for the output.

In addition to testing each of the programs under its native operating environment (MS-DOS 6.22, Windows for Workgroups 3.11, Windows 95, or OS/2 Warp Connect Version 3.0), we also tested the Windows 3.1 versions of WordPerfect and Word Pro under Windows 95. (DeScribe has a Windows 95 native version.) We ran Microsoft Mail (Version 3) simultaneously with each program on each environment.

For the text portion of our loading, scrolling, and printing tests, we imported a 30K ASCII file into each program. For DOS, Windows, and Windows 95, we formatted the text in a 12-point Times New Roman TrueType font. For OS/2 Warp, we used a 12-point Times Roman Adobe Type Manager font and set the margins appropriately to ensure that the text paginated identically in each program. We then saved the document in each program's native format.

We also used a compound document for loading, scrolling, and printing tests. This two-page document had a 750K TIFF image at the center of the first page and a 16K .PCX file at the bottom of the second page, with text throughout the document. We saved the document in each program's native format.

We were not able to run compound document tests on Clearlook, since it

didn't support these graphics formats. In addition, although WordPerfect for DOS can handle graphics in text mode, we limited testing of the compound document to the program's graphics mode, the more likely environment for such documents.

For the **Application Load** test, we measure the time it takes to load the application.

The **Document Load** test measures the time it takes to load each document from a disk.

In our **Scroll** test we measure how long it takes to move from the first line of the document to the last line by pressing the Down Arrow key. We execute the appropriate shortcut key sequence to move immediately back to the top of the document and then repeat the process.

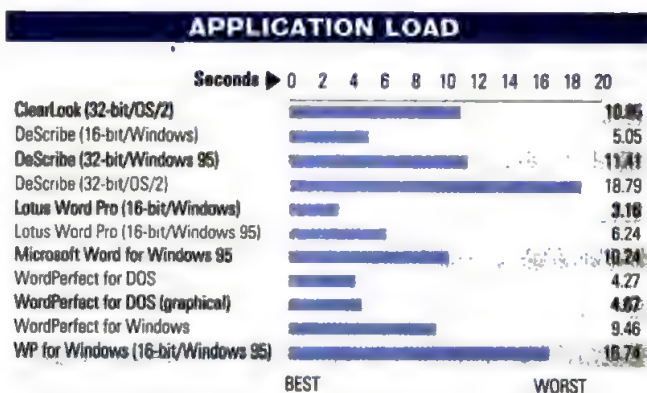
For our **Print** test, we measure how long it takes from the time the print command is issued to the time control is returned to the user and the time until the first and last pages print.

We also ran six other tests (but didn't produce charts of results here). The **Print Preview** test measures the amount of time required to view the first page of the document as it would print. Some programs have a specific Print Preview function, while others merely zoom to an editable full-page view. The text document preview was less than 1 second for all the products except Lotus Word Pro (approximately 2 seconds) and WordPerfect 6.1 for DOS (5 seconds). WordPerfect 6.1 for Windows was by far the best at previewing the compound document.

The **Search and Replace** test looks through the long text document for every instance of the word *gun* (101 occurrences) and replaces it with *run*. Each of the products completed this test in less than 2 seconds.

For the **Save File** test, we add, delete, and move small amounts of text in our text document. We then save the file under its existing filename to exercise the program's ability to save changes only, as well as under a new filename to test the time required to save a new document. Each of the products took approximately 1 second with the exception of Lotus Word Pro, which took three times as long in Windows 95 and four times as long in Windows for Workgroups.

We also ran tests on the file management functions in WordPerfect (DOS and Windows) and Microsoft Word for Windows 95 and found the results to be consistent between the two products. The **Index** test indexed the contents of a directory of 100 documents and took from 14 to 21 seconds. The **Search File (Indexed)** test, which looked for a word contained in two of the documents in this directory, was completed in less than 2 seconds. The **Search File (Unindexed)** test performed the same action on an identical set of files in a directory that had not been indexed. Results varied from 7 to 9 seconds.



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The software learns your typing habits. It lets you concentrate on the words, not on how to spell them.

Spell-checking now happens on the fly, as you type. Misspelled words are underlined so you can correct them as you go. Click on the right mouse button and alternative spellings appear. Common mistakes everyone makes when typing are corrected by the software automatically. (*Thier* is changed to *Their* every time you type it.)

And it learns to recognize both the idiosyncratic mistakes you have a tendency to make, and the peculiar names, abbreviations, and spellings you don't want it to correct. If you override a correction, it adds the word or phrase to its exceptions list and never makes that change again. It has even learned to speak your language. If you have a question, you ask the Answer Wizard in plain English. "How do I make this into two columns?" It gives you step-by-step instructions. You stop working only long enough to type in your question.

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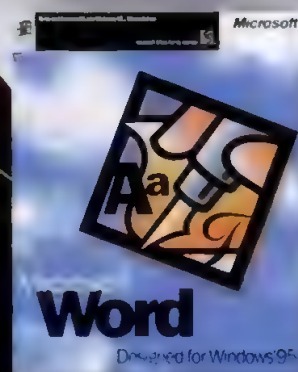
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 **Start**

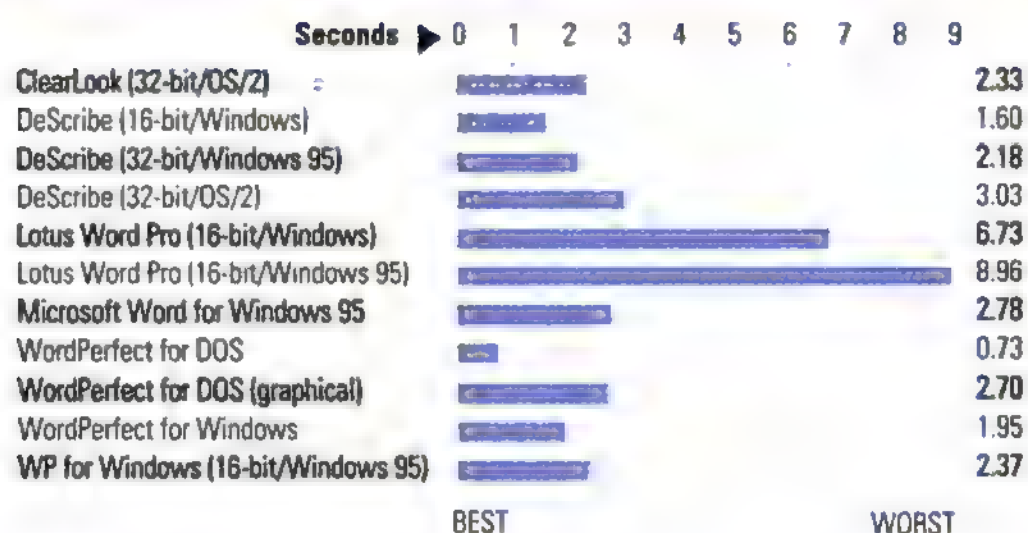


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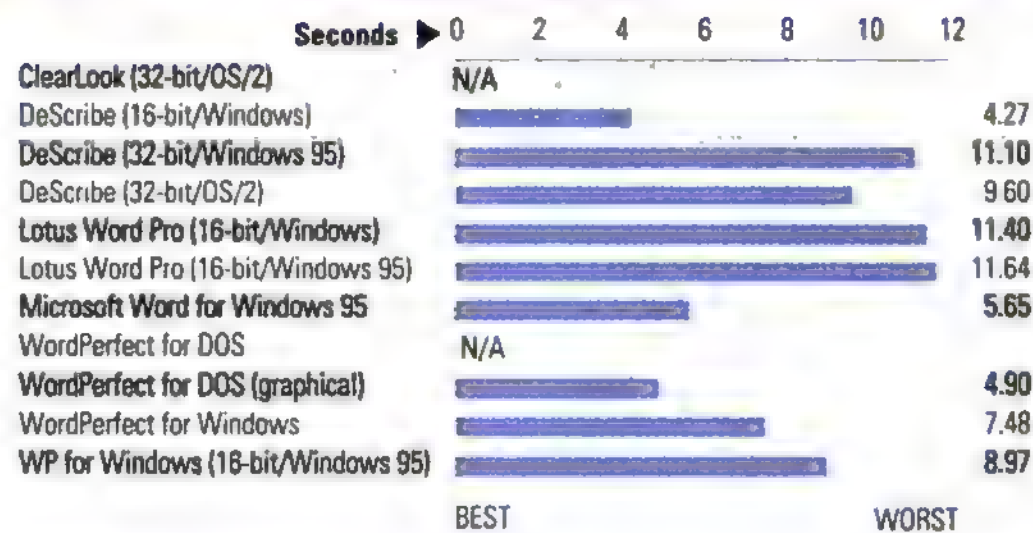
New Microsoft Word is designed to work hand-in-hand with the 32-bit performance, advanced multitasking, and simplified user interface of the Windows 95 operating system. It integrates seamlessly with the other programs in new Microsoft Office. The combination of new programs and a new operating system makes computing fundamentally faster and easier. Easier for you to focus on your work, not on your software.

DOCUMENT LOAD

TEXT



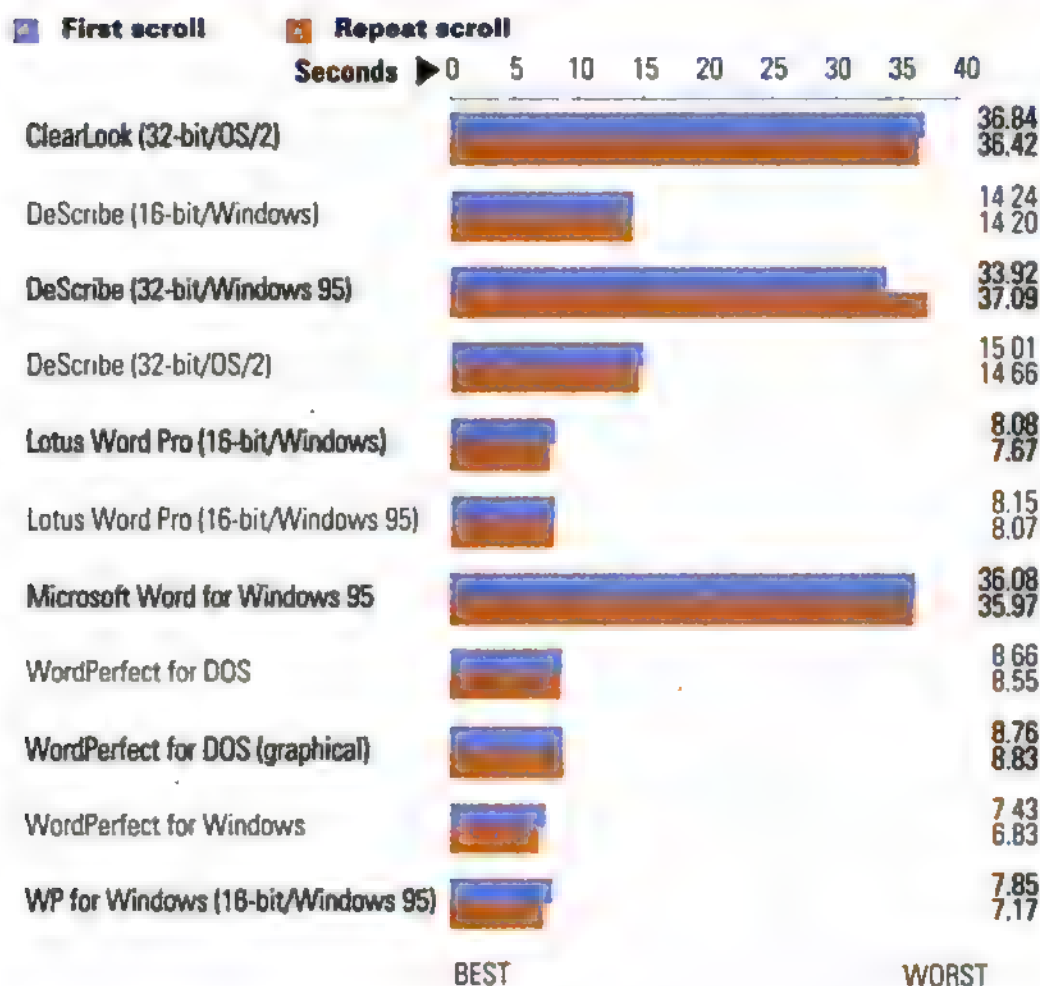
COMPOUND



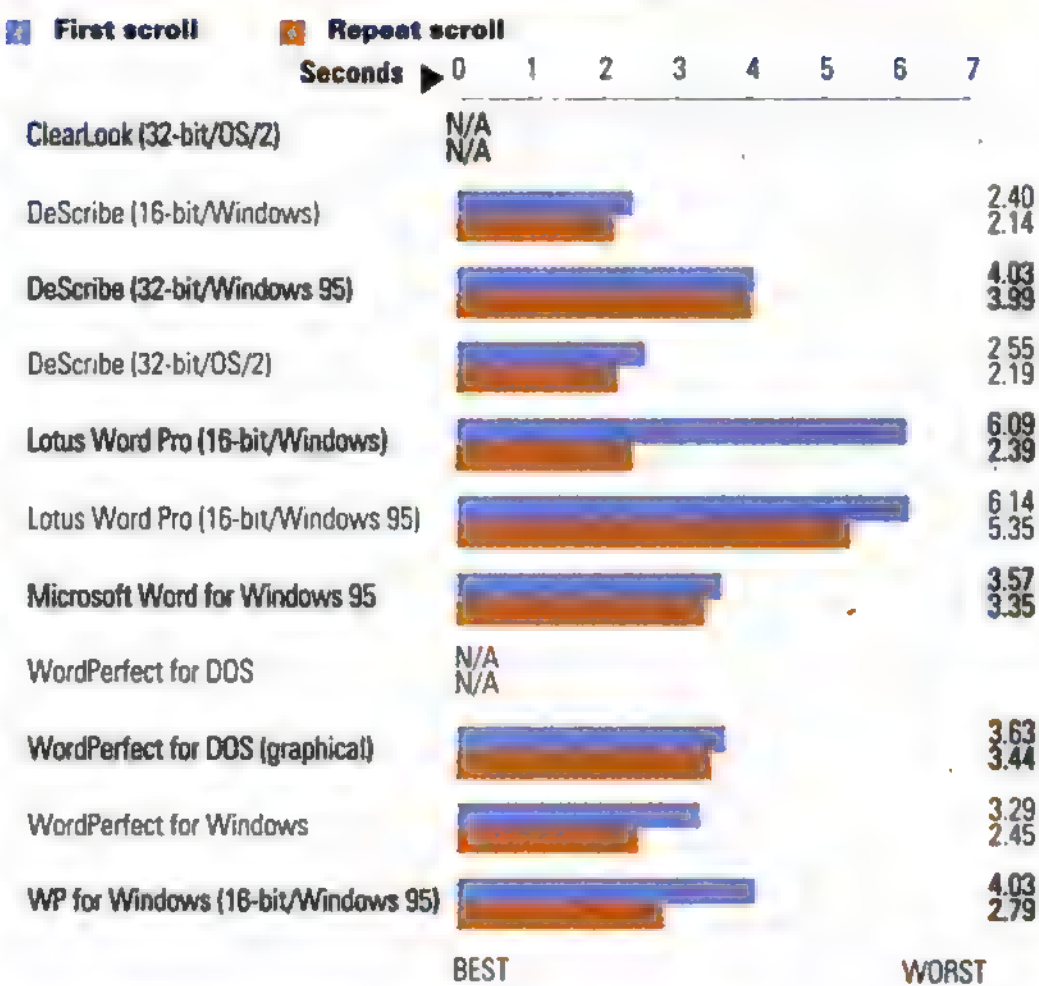
N/A—Not applicable: The program does not support .PCX and TIFF graphics

SCROLL

TEXT



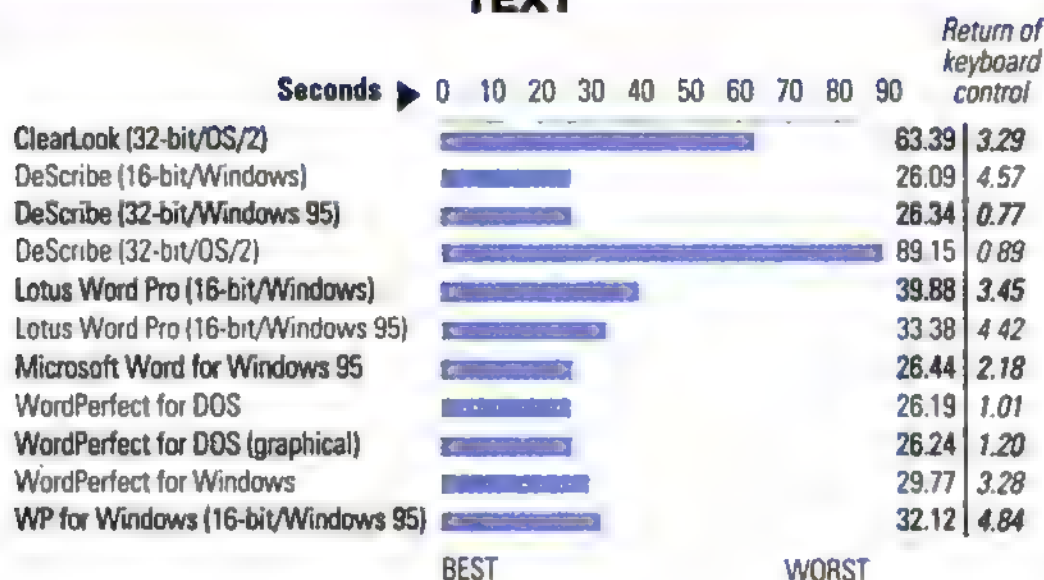
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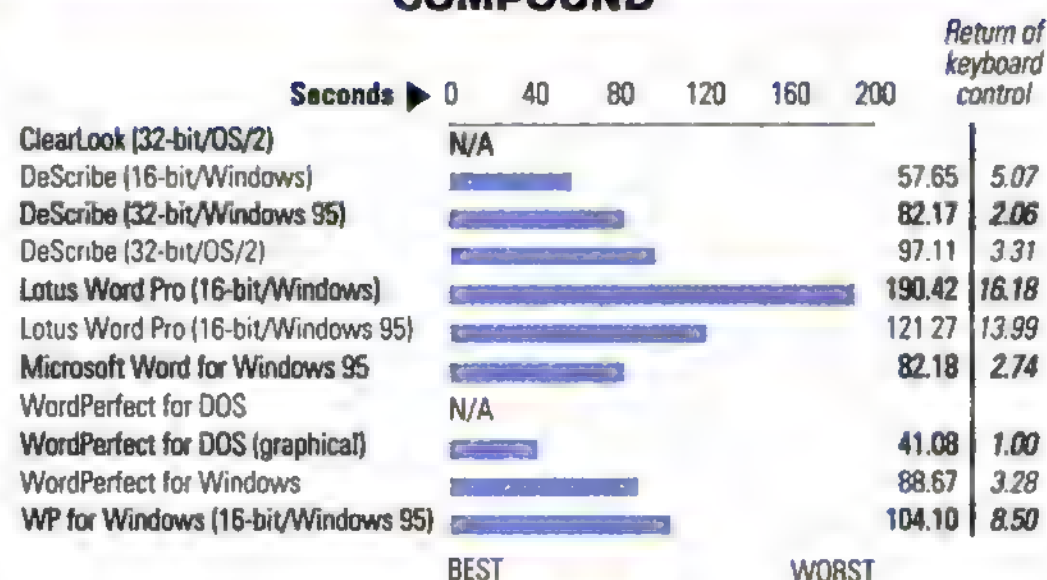
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PRINT

TEXT



COMPOUND



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System Requirements: A PC equipped with a 386, 486, Pentium or equivalent processor • Windows 1.0 or 3.11, Windows 95 • Workgroups 3.11 or 3.11 • 4 MB RAM required



MAKE MOVIES



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TAKE PICTURES



BE CREATIVE

SUMMARY OF FEATURES

Word Processors



■ YES ■ NO

Products listed in alphabetical order

	Ability for Windows	Clearlook 1.5	DeScribe Word Processor	Lotus Word Pro 96 Edition for Windows 3.1	Microsoft Word for Windows 95	Microsoft Works for Windows 95	Perfect-Works 2.1
List price	\$229.00	\$169.00	\$49.95	\$105.00	\$339.00	\$54.95 (CD-ROM, \$79.95)	\$99.00
Operating system	Windows 3.1 or later	OS/2 2.0 or later	OS/2 2.11 or later, Windows 3.1 or later, Windows NT 3.51 or later, Windows 95	Windows 3.1 or later	Windows NT 3.51 or later, Windows 95	Windows NT 3.51 or later, Windows 95	Windows 3.1 or later
Memory and Disk Usage							
Disk space used for default installation (minimum, maximum)	20MB (7MB, 20MB)	3MB (3MB, 3MB)	16MB (4MB, 22MB)	35MB (15MB, 35MB)	16MB (8MB, 35MB)	20MB (5MB, 20MB)	22MB (8MB, 22MB)
Number of files user can open at once	Depends on RAM	Depends on RAM	Depends on RAM	9	Depends on RAM	8	9
User can edit different parts of a file in different windows	■	■	■	■	■	■	■
Screen Display							
Different zoom levels in different windows	■	■	■	■	■	■	■
Formats using inserted codes	■	■	■	■	■	■	■
Formats using paint-and-format method	■	■	■	■	■	■	■
User can set margins and tabs on ruler	■	■	■	■	■	■	■
Toolbar for font and text attributes	■	■	■	■	■	■	■
User can display or hide paragraph markers	■	■	■	■	■	■	■
User can suppress display of page margins	■	■	■	■	■	■	■
Optional draft mode	■	■	■	■	■	■	■
Can wrap lines at window border	N/A	N/A	■	■	■	■	N/A
Text and Page Layout Features							
Stylesheets	■	■	■	■	■	■	■
User can change format by changing stylesheets	N/A	■	■	■	■	■	■
Can keep multiple paragraphs on one page	■	■	■	■	■	■	■
Nonbreaking paragraphs	■	■	■	■	■	■	■
Snaking (newspaper) columns	■	■	■	■	■	■	■
Parallel text columns (other than in table)	■	■	■	■	■	■	■
Can extend to next page	N/A	N/A	■	■	■	N/A	N/A
Maximum number of columns	6	255	100	Unlimited	34	Unlimited	8
User can define columns on ruler	■	■	■	■	■	■	■
Borders around paragraphs	■	■	■	■	■	■	■
Text frame can be anywhere on page	■	■	■	■	■	■	■
Frame can expand with added text	■	■	■	■	■	■	■
Text can flow between frames	■	■	■	■	■	■	■
Auto-formats	■	■	■	■	■	■	■
Paragraph numbering	■	■	■	■	■	■	■
Text-Entry and Editing Features							
Number of undelete or undo levels	20	Unlimited	Unlimited	Unlimited	100	1	100
Can search on and replace format settings or styles	■	■	■	■	■	■	■
Can search and replace fonts	■	■	■	■	■	■	■
Can search and replace multiple word forms	■	■	■	■	■	■	■
Supports nonstandard characters	■	■	■	■	■	■	■
Keyboard shortcuts for nonstandard characters	■	■	■	■	■	■	■
Automatically inserts typographic quotation marks	■	■	■	■	■	■	■
Can replace two hyphens with a dash	■	■	■	■	■	■	■
Nonprinting comments or "sticky notes"	■	■	■	■	■	■	■
Text highlighting	■	■	■	■	■	■	■

N/A—Not applicable. The product does not have this feature.

PC MAGAZINE EDITORS' CHOICE PC MAGAZINE EDITORS' CHOICE		
WordExpress for Windows	WordPerfect 6.1 for DOS	WordPerfect 6.1 for Windows
\$49.95	\$295.00	\$395.00
Windows 3.1 or later	DOS 3.1 or later	Windows 3.1 or later
5MB (3MB, 6MB) Depends on RAM	16MB (7MB, 16MB)	32MB (12MB, 32MB)
9	9	9
N/A		
N/A	24	24
1	3	100

Word Pro's own graphics, equation, and charting tools are tightly integrated into the program; they aren't separate OLE servers. Word Pro's master documents can be organized to combine divisions included in the master document file itself.

For correcting or modifying text and graphics, the new interface uses "modeless" boxes, which remain accessible while you work in the document. A floating tabbed InfoBox gives access to all formatting controls, which include letter spacing, customized bullets and numbering, and snap-to-grid frames.

Built-in Internet features include the ability to import a World-Wide Web page from a remote site if you have a connection to the Internet open. Word Pro converts HyperText Markup Language files into its own format and then converts them back for export.

BETTER AMI THAN AMI

Word Pro's predecessor, Ami Pro, was strong in graphics features but weaker in text handling. Word Pro retains all of Ami Pro's graphics features—built-in drawing, charting, TIFF image enhancement, and an intuitive equation editor—while greatly enhancing text handling.

Unlike Ami Pro, Word Pro can display the foot of one page and the top of the next on-screen at the same time, and its formatted draft mode displays page breaks without headers and footers. The outline view places next to each heading a button that you can right-click for a menu that lists outline options.

Strong table and frame features include the ability to place anything—including frames, tables, and columns—within other frames or table cells, and tables that support the basic formula syntax of Lotus 1-2-3. A toolbar icon quickly inserts the formula that sums a row or a column.

The help system lets you write natural-language "how do I" questions, and the detailed answers partly make up for the skimpiness of the manual, but that's not enough. The program is woefully lacking in detailed installation instructions, and it also lacks a real tutorial. That may slow you down as you try to

learn Word Pro, but once you understand its approach, the program is easy to use.

The overall feel of Word Pro is slightly sluggish, as expected with a first release, and after a few GPFs and lockups, we reduced the interval between automatic backups. Despite minor teething pains, Word Pro is a magnificent achievement that other programs may not be able to equal for many years.

Lotus Word Pro 96 Edition for Windows 3.1. List price: \$105; upgrade, \$85 (\$20 mail-in rebate). Requires: 486/66-based PC or better, 8MB RAM, 35MB hard disk space, Microsoft Windows 3.1 or later. Lotus Development Corp., 1000 Abernathy Rd., #1700, Atlanta, GA 30328; 800-343-5414, 770-391-0011; fax, 770-698-7653. Circle 476 on reader service card

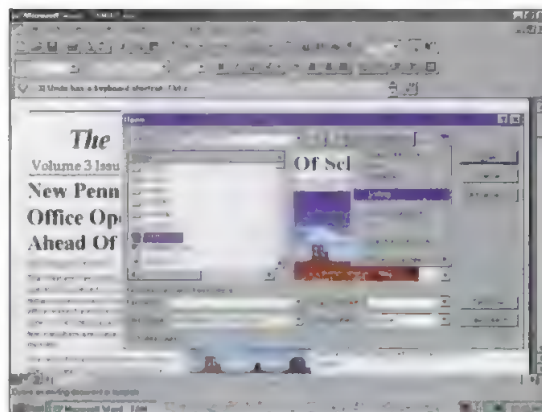
Microsoft Corp.

Microsoft Word for Windows 95



Microsoft Word for Windows (\$339) didn't get a complete overhaul when Microsoft released a new version designed for Windows 95, but this package was already good enough not to need many changes.

Despite minor inconveniences, Word stands out for its clarity, maturity, reliability, and tight integration into Windows 95. It doesn't match Word Pro's versioning and workgroup features—or WordPerfect's advanced file-management,



Microsoft Word for Windows 95 modifies Windows' standard File Open dialog box with options that the program remembers from one session to the next. Note the Tip Wizard toolbar underneath the formatting ribbon.

SUMMARY OF FEATURES

Word Processors



■ YES ■ NO

Products listed in alphabetical order

	Ability for Windows	Clearlook 1.5	DeScribe Word Processor	Lotus Word Pro 96 Edition for Windows 3.1	Microsoft Word for Windows 95	Microsoft Works for Windows 95	Perfect-Works 2.1
Keystroke to turn on select mode	■	■	■	■	■	■	■
Templates prompt for input	■	■	■	■	■	■	■
Spelling, Hyphenation, Thesaurus, and Grammar Features							
Does full-dictionary spell-checking on the fly	■	■	■	■	■	■	■
Can auto-correct as you type	■	■	■	■	■	■	■
Can display all misspelled words simultaneously	■	■	■	■	■	■	■
Document-specific supplementary dictionary	■	■	■	■	■	■	■
Hyphenates on the fly	■	■	■	■	■	■	■
Hyphenates using dictionary	■	■	■	■	■	■	■
User can enter soft hyphens	■	■	■	■	■	■	■
Thesaurus	■	■	■	■	■	■	■
Integrated grammar checker	■	■	■	■	■	■	■
Table and Numeric Features							
Interactive table-format editor	■	■	■	■	■	■	■
Table row can cross page breaks	■	■	■	■	■	■	■
Table cells can include graphics	■	■	■	■	■	■	■
Sample table formats	■	■	■	■	■	■	■
Dynamic spreadsheet functions	■	■	■	■	■	■	■
Can display cell value elsewhere in text (floating cell)	■	■	■	■	■	■	■
Auto-formatting of headings	■	■	■	■	■	■	■
Graphics Features							
Drawing tools	■	■	■	■	■	■	■
Bitmap enhancement tools	■	■	■	■	■	■	■
Can import directly from scanner	■	■	■	■	■	■	■
Graphics can be positioned like characters in text flow	■	■	■	■	■	■	■
Graphics formats:							
.GIF	■	■	■	■	■	■	■
.JPG	■	■	■	■	■	■	■
.PCD	■	■	■	■	■	■	■
.PCX	■	■	■	■	■	■	■
.TIFF	■	■	■	■	■	■	■
.WPG	■	■	■	■	■	■	■
Text art (font modification and effects)	■	■	■	■	■	■	■
Charting	■	■	■	■	■	■	■
Can flow one-column text on both sides of a graphic	■	■	■	■	■	■	■
Complex-Document Creation							
Collapsible outlines	■	■	■	■	■	■	■
Tabbed document sections	■	■	■	■	■	■	■
Automatic table of contents	■	■	■	■	■	■	■
Indexing	■	■	■	■	■	■	■
Automatically numbers endnotes/footnotes	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Can cross-reference to page number	■	■	■	■	■	■	■
Can cross-reference to outline number	■	■	■	■	■	■	■
Can cross-reference to paragraph number	■	■	■	■	■	■	■
Master documents	■	■	■	■	■	■	■
Client/server OLE support	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Printing Features							
Can print defined block	■	■	■	■	■	■	■
Can print discontinuous range of pages	■	■	■	■	■	■	■
Can print current page	■	■	■	■	■	■	■
Can automatically address envelopes for printing	■	■	■	■	■	■	■

N/A—Not applicable: The product does not have this feature

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Promotional pricing is not discountable. **The VeriTest Cross-Country v2.0 test simulates typical executive use of Microsoft Office® applications in Microsoft Windows® 3.11 during an airplane flight. Power management was enabled and 8MB RAM was installed. VeriTest, Inc. is located in Santa Monica, CA. For a complete copy of our Guarantees or Limited Warranties, please write Dell USA L.P., 2214 W. Braker Lane, Building 3, Austin, TX 78758. *Business leasing arranged by Leasing Group, Inc. *Prices and specifications valid in the U.S. only and subject to change without notice. Microsoft, Windows and the Windows logo are registered trademarks of Microsoft Corporation. The Intel Inside logo and Pentium are registered trademarks and IntelDX4 is a trademark of Intel Corporation. ©1995 Dell Computer Corporation. All rights reserved.



Designed for



SUMMARY OF FEATURES

Word Processors



■ YES □ NO

Products listed in alphabetical order

	Ability for Windows	Clearlook 1.5	DeScribe Word Processor	Lotus Word Pro 96 Edition for Windows 3.1	Microsoft Word for Windows 95	Microsoft Works for Windows 95	Perfect-Works 2.1
Can collate print job	■	■	■	■	■	■	■
File Management and Import and Export Features							
Timed backup	■	■	■	■	■	■	■
File management	■	■	■	■	■	■	■
Can print files without opening them (from file-manager list)	■	■	■	■	■	■	■
Document descriptions	■	■	■	■	■	■	■
Can search disk for filenames/text in files	■	■	■	■	■	■	■
User can view a file before opening	■	■	■	■	■	■	■
File-import formats:							
Ami Pro	■	■	■	■	■	■	■
Microsoft Word for DOS	■	■	■	■	■	■	■
Microsoft Word for Windows 2.x	■	■	■	■	■	■	■
Microsoft Word for Windows 6.x	■	■	■	■	■	■	■
WordPerfect 5.x	■	■	■	■	■	■	■
WordPerfect 6.x	■	■	■	■	■	■	■
File-export formats:							
Ami Pro	■	■	■	■	■	■	■
Microsoft Word for DOS	■	■	■	■	■	■	■
Microsoft Word for Windows 2.x	■	■	■	■	■	■	■
Microsoft Word for Windows 6.x	■	■	■	■	■	■	■
WordPerfect 5.x	■	■	■	■	■	■	■
WordPerfect 6.x	■	■	■	■	■	■	■
Macros							
Recorded-keystroke/programmable macros	■	■	■	■	■	■	■
Keyboard remapping	■	■	■	■	■	■	■
Glossary	■	■	■	■	■	■	■
Corporate and Professional Features							
Address book	■	■	■	■	■	■	■
Data-import formats:							
dBASE	■	■	■	■	■	■	■
Lotus 1-2-3	■	■	■	■	■	■	■
Microsoft Excel	■	■	■	■	■	■	■
SQL query option	■	■	■	■	■	■	■
Can sort paragraphs	■	■	■	■	■	■	■
User-selectable sorting fields	N/A	N/A	■	■	■	N/A	N/A
Programmable mail-merge	■	■	■	■	■	■	■
Can print mailing labels	■	■	■	■	■	■	■
Can process preformatted forms	■	■	■	■	■	■	■
Marks revisions (redlines) on the fly	■	■	■	■	■	■	■
File comparison	■	■	■	■	■	■	■
Includes group-editing notes with users' initials	■	■	■	■	■	■	■
Can store multiple versions in the same file	■	■	■	■	■	■	■
Password protection	■	■	■	■	■	■	■
File encryption	■	■	■	■	■	■	■
HTML export (built-in or free add-on)	■	■	■	■ (built-in)	■ (free add-on)	■	■
Notes F/X support	■	■	■	■	■	■	■
Help and Documentation							
Step-by-step, on-screen demonstrations	■	■	■	■	■	■	■
"Natural-language" help questions	■	■	■	■	■	■	■
Comprehensive printed manual	■	■	■	■	■	■	■
Free technical support	■	■	■	■ (60 days)	■	■	■
Toll-free number	■ (30 days)	■	■	■	■	■	■

N/A—Not applicable: The product does not have this feature

NSA

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WordPerfect for Windows



The vast power, flexibility, and range of features in WordPerfect 6.1 for Windows more than make up for the minor failings of its interface and overall coherence. Novell's \$395 word processor for Win-

■ (tree add-on)

SUITABILITY TO TASK

WordPerfect for Windows

	Power	Ease
Formatting/layout	Excellent	Good
Composing/editing text	Excellent	Good
File management	Excellent	Excellent
User automation	Good	Good
Collaboration	Fair	Fair
Advanced	Excellent	Excellent

For legal and other structured documents, WordPerfect offers unrivaled support for paragraph and outline numbering, and it is the only program that includes



WordPerfect 6.1 for Windows uses specialized toolbars, like the Drop Cap bar shown here, for control over complex formatting and automation features.



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your customized numbering format in cross-references to numbered paragraphs. Built-in tools let you create hypertext links within and between WordPerfect files.

UNSURPASSED FILE MANAGEMENT

WordPerfect's built-in file management surpasses that of most standalone file managers. Every dialog box in which you can select a file includes a full-scale file manager, complete with customizable file listings, descriptive titles, viewers, Quick-List (which lets you give a descriptive name to a directory or file specification) and the QuickFinder indexer (which permits lightning-fast access to any text).

Like Word Pro and Word, WordPerfect automatically replaces straight quotation marks with typographic ones and corrects misspellings on the fly. A button in the Spelling dialog box lets you add correction pairs while checking a document. The same technology found in QuickFinder is available for searching and replacing multiple word forms in a file. The 300-level Undo feature optionally displays a history box with entries such as "Delete Word," but WordPerfect lets you save the history list with the document so you can undo actions from previous sessions. The program compares files but won't redline on the fly.

Graphics features include elaborate customizable styles for borders, boxes, lines, fills, and tables, plus an option to wrap text around irregularly shaped images. The TextArt module, which twists character shapes, is the best of its kind. Large initial dropped capitals are created easily from a menu, although WordPerfect for DOS positions a drop cap more accurately. The drawing and charting modules are the same advanced tools used in Novell's Presentations program. The one weak link is the code-based equation editor, essentially unchanged since it was introduced in WordPerfect 5.1 for DOS.

Unlike Word and Word Pro, WordPerfect lets you edit only one part of a file at a time. If you open a second window on the same file, you must save it under another name. You can view two pages at once but not thumbnails of multiple pages.

Menus, keyboards, and toolbars are easily customized, and you can switch easily among keyboard definitions. WordPerfect's traditional Reveal Codes window looks out of place in Windows but permits

unusually precise control over formatting.

The thick manual scarcely documents WordPerfect's customization options and complex functions, and the menu structure is more confusing than it needs to be. Despite some weak spots and awkwardly implemented features, WordPerfect remains one of the most powerful and full-featured applications ever written.

WordPerfect 6.1 for Windows. *List price: \$395; upgrade, \$99. Requires: 486-based PC or better, 6MB to 8MB RAM, 12MB to 32MB hard disk space, Microsoft Windows 3.1 or later. Novell Inc., 1555 N. Technology Way, Orem, UT 84057. 800-451-5151, 801-226-6800; fax, 801-222-5077. Circle 479 on reader service card*

Novell Inc.

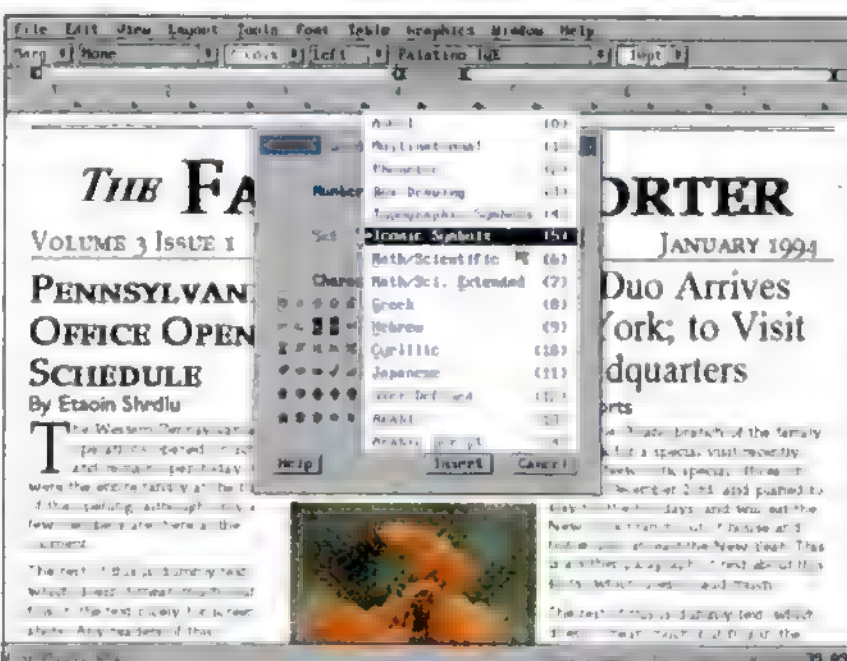
WordPerfect for DOS



WordPerfect 6.1 for DOS proves that you don't need an advanced operating system to enjoy one of today's most advanced word processors. Novell's \$295 package offers almost all of the features of WordPerfect for

Windows, in an interface that can be used both in character-based text mode and in a proprietary graphics mode that supports high-resolution screens.

The DOS version uses the same file format as the Windows version, but many features, including custom paragraph numbering and oversize dropped capitals, either produce better results or are easier to use.



Yes, this is a DOS program. WordPerfect 6.1 for DOS has an optional graphic interface and comes with an enormous set of technical and international characters that it can display and print.

SUITABILITY TO TASK

WordPerfect for DOS

	Power	Ease
Formatting/layout	Excellent	Good
Composing/editing text	Excellent	Good
File management	Excellent	Excellent
User automation	Excellent	Excellent
Collaboration	Poor	Fair
Advanced	Good	Good

Some features are unique to the DOS version, like math functions in the text in addition to tables, built-in fax support, and a brilliantly designed task-switching DOS shell, supplied in the package, that includes 80 separate clipboards for cutting and pasting between applications.

CLEAN SCREEN

The classic WordPerfect screen is still an option in Version 6.1, but you can fill both the text and graphics displays with a top-line menu, a context-sensitive right-click pop-up menu, a customizable toolbar, an outline toolbar, a formatting ribbon, and—in graphics mode only—a formatting ruler.

Setup options let you select from a variety of keyboard layouts, all customizable, including some well stocked with macros. Both text and graphics modes permit multiple windows, and the graphics screen supports different zoom levels in different windows. Windows-style customization features include control over features like mouse and cursor speed.

Font support in WordPerfect for DOS far outclasses anything possible in Windows. WordPerfect imports and displays

soft fonts in all current formats: Type 1, TrueType, Speedo, Intelifont, and LaserJet bitmapped fonts. Typographic quotation marks automatically replace straight marks.

Except for this problem, WordPerfect's customizable printer drivers support all the characters in all soft-font formats, and all the characters built into your printer, not merely the limited set available in the Windows environment. These drivers also let you customize features that cannot be modified under Windows.

Format control is as flexible as in the Windows version but

sometimes unintuitive unless you set margins and indents from the tab ruler available in graphics mode. Both the DOS and Windows versions include a quick-format feature that's superior to similar features in Word and Word Pro because it applies styles while it applies formatting.

Paragraph numbering is more difficult to apply than in WordPerfect 5.1 but more manageable than in WordPerfect for Windows. Tables support AutoFill and spreadsheet functions. Basic table formatting is controlled in graphics mode from the ruler, but more advanced formatting uses awkward dialog boxes.

Strong file management features, with the same descriptive names supported by the Windows version, include the Quick-Finder file indexer and moderately effective conversion filters. As in the Windows version, drop-down history lists let you reuse earlier search strings, macros, opened files, and more.

Automated templates are startlingly easy to build—far easier than in any Windows program. To create a fill-in prompt, simply type the text of the prompt between square brackets; to insert a data field from an address book or from your own personal information, simply type the field name between angle brackets.

A few features of the Windows version could not fit into the DOS version. There's no option for finding and replacing multiple verb forms or using them in a Quick-Finder search. You have to import images instead of drawing or scanning them. But the DOS version's interface has speed features that Windows users can only envy. Spell-checkers in Windows applications use awkward Alt-key combinations or tedious mouse clicks. In WordPerfect for DOS, the speller is controlled with single keystrokes.

WordPerfect 6.1 for DOS is a splendid achievement, far surpassing anything imaginable in the DOS environment a few years ago. For speed, convenience, and ease, it yields little or nothing to its GUI-based competition.

WordPerfect 6.1 for DOS. *List price: \$295; upgrade, \$89. Requires: 386-based PC or better, 480K RAM, 7MB to 16MB hard disk space, DOS 3.1 or later. Novell Inc., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-226-6800; fax, 801-222-5077.*

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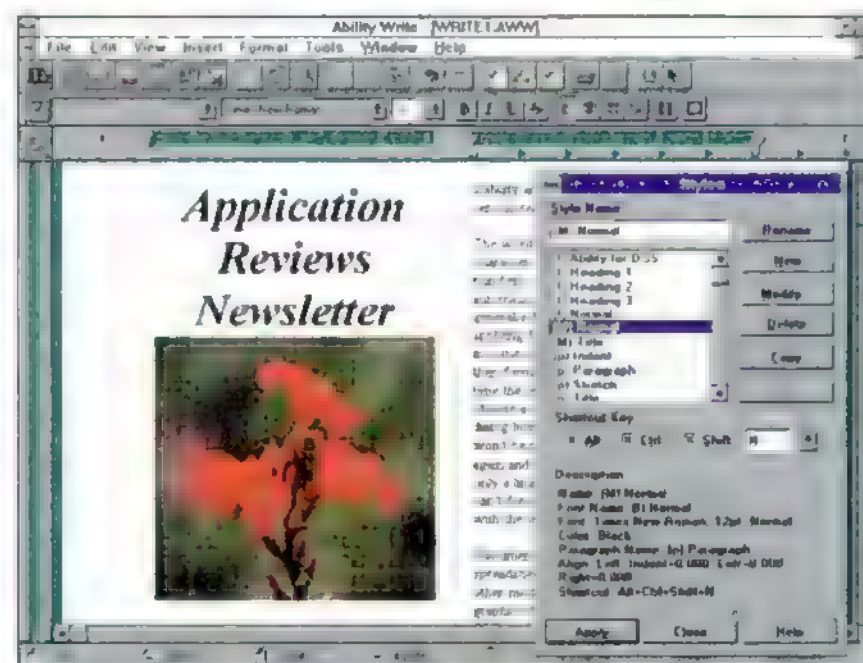
Integrated Word Processors

Some of today's integrated packages contain surprisingly strong word processors. Here, we look at four of them.

Ability Plus Software
Ability for Windows

Ability for Windows is a \$229 integrated package that has more features and a better-looking interface than you might expect from a not-so-well-known vendor, Ability Plus Software. This OLE 2.0-enabled program shares text and graphics among its eight separate applications: word processor, spreadsheet, database, library manager, forms, drawing, charting, and communications.

The package fits into 20MB hard disk space, about the same amount needed for a complete installation of Microsoft Works or Perfect Works. Its screens are colorful and striking, and its feature set is implemented in clever and original ways. But in general it lacks the stability and ease of use needed to make it a serious rival to Microsoft's and Novell's offerings.



Ability for Windows combines a straightforward graphics interface with highly detailed information boxes. Note the clock on the status bar, which always says three o'clock.

SUITABILITY TO TASK		
Ability for Windows		
	Power	Ease
Formatting/layout	Fair	Fair
Composing/editing text	Fair	Fair
File management	Fair	Fair
User automation	Fair	Good

The word processor supports named character and paragraph styles, bullets and numbers, and snaking columns that are automatically balanced in length. You generally follow Windows conventions by applying formatting before entering text, but in some cases you have to enter text first and then format it.

To create a numbered list, you type the text of the list, select it, and then choose a numbering style from a confusing dialog box. If you later insert a new item, it won't be numbered until you select the list again and reapply the style (note that no other

low-end integrated package supports paragraph numbers at all). Styles control only a limited set of format features, and you can't force a heading to stay on the same page with the text that follows.

LIVE LINKS

Documents can include live links to spreadsheets and database fields from the other modules in the package, and can embed graphics from the draw module or any other OLE-enabled application. You can drag and drop between modules.

Mail-merge uses the data-

base module and includes an option for printing database labels. The default view includes a toolbar, ribbon, status bar, and vertical and horizontal rulers but can be reduced to a totally clean screen. You work in a zoomable full-page view only, complete with headers and footers.

As with advanced word processors, you can edit different parts of the same file in different windows. As with more primitive programs, the current line flickers distractingly while you type.

The interface combines intuitive controls over basic formatting with cluttered information boxes that tell you more than you want to know. You insert special characters from a simple button palette that displays the full symbol set of any installed font. But the style dialog lists measurements in thousandths of an inch, and the document statistics screen includes a count of styles and OLE objects in the file in addition to the usual word and character counts.

Ability for Windows is a brave attempt to beat Microsoft and Novell at their own game, but a less-than-coherent design, an installation that dumps obsolete OLE files in your Windows directory, and the total absence of presupplied document templates will probably make you look elsewhere.

Ability for Windows. List price: \$229 (\$179 until December 31, 1995). Requires: 4MB RAM, 20MB hard disk space, Microsoft Windows 3.1 or later. Ability Plus Software, 6816 Morrison Blvd., Charlotte, NC 28211; 800-946-4277, 704-364-3346; fax, 704-364-5676; e-mail, info@ability.com.

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Microsoft Corp.

Microsoft Works for Windows 95

Microsoft Works for Windows 95 is so thoroughly automated in its features and its help system that you may come to resent it for making you put in any effort at all. Microsoft's integrated package, which requires Windows 95 or Windows NT 3.51, sells for a mere \$54.95. A CD-ROM version, with Microsoft Bookshelf 95 included, costs \$79.95. The full package includes word processor, spreadsheet, database, and communications modules, plus OLE servers for

drawing, charting, clip-art management, and sticky notes.

Everything is tightly integrated, and all features are designed to make beginning users productive from the moment they start. The help menu fills a third of the screen until you turn it off. When you manipulate an object, the cursor displays the word *Copy* or *Drag* in tiny letters instead of making you guess what will happen next.

Some 39 task wizards design documents, spreadsheets, and databases for you and remember your name, address, and style preferences automatically.

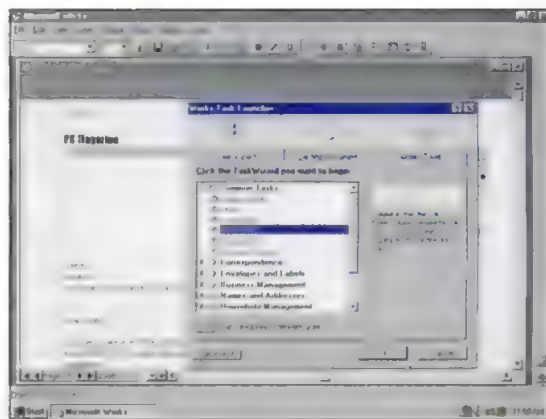
In case you're too lazy to write your own letters, Works (like Microsoft Word for Windows) comes with over 100 samples already written for you.

WORD PROCESSING MODULE

The word processing module displays zoomable full-page and draft views, but only one page at a time. If a sentence straddles a page break, you have to switch to draft view to see the complete sentence. A gallery of 24 predefined paragraph styles provides a full range of format options, and you can add styles or modify existing styles to your heart's content.

Text can flow in snaking columns, but the column format applies to the whole document, so the only way to make a headline straddle columns is by putting in the page header or by importing text in a box from the WordArt font manipulation module. You'll find it easier to use Works' supplied wizards and templates instead of wrestling with advanced formatting on your own.

The envelope wizard remembers your return address and can find mailing addresses in the built-in address book but won't automatically find the address in your document.



Microsoft Works for Windows 95 fills its screen with extraneous ornaments and borders, but its wizards do an efficient job of creating well-designed documents.

FILE MANAGEMENT MIX

File management in Works is a mixture of convenience and frustration. A Task Launcher dialog lets you use wizards or templates and open recently used documents, but the document list doesn't support Windows 95 pop-up menus. If you want to delete a file, you have to go to the standard File Open dialog and use a pop-up menu there.

The help system is so insistently helpful that it quickly becomes intrusive, because you have to find a Shrink Help button to make it go away after it covers your work. In case you can't figure out a program feature, an option on the Help menu connects to The Microsoft Network's Works forum, so you can pay Microsoft for the connect time needed to find the answers. Users who learn to rely on this kind of on-line help (an emerging trend not just at Microsoft) will have to keep an eye on the potentially high cost of it.

The program itself suffers from minor display glitches, like documents that sometimes appear on-screen with the lines squashed together, although they print correctly.

Works is a spectacular work of automation, and if you don't mind using its wizards to create your documents, it produces spectacular results. But if you plan to use an integrated package primarily for the sake of its word processor, you'll get better results from the more powerful word processing module in PerfectWorks. **Microsoft Works for Windows 95.** List price: \$54.95; upgrade, \$44.95 (\$10 mail-in rebate); CD-ROM version (with Microsoft

SUITABILITY TO TASK
Microsoft Works for Windows 95

	Power	Ease
Formatting/layout	Fair	Excellent
Composing/editing text	Fair	Excellent
File management	Fair	Fair
User automation	Good	Excellent

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Bookshelf), \$79.95. Requires: 386-based PC or better, 6MB RAM, 5MB to 20MB hard disk space, Microsoft Windows 95 or Windows NT 3.51 or later. Microsoft Corp., One Microsoft Way, Redmond, WA 98052; 800-426-9400, 206-882-8080; fax, 206-936-7329.

Circle 481 on reader service card

Novell Inc.

PerfectWorks

PerfectWorks 2.1 looks and acts more like an exceptionally convenient office application suite than a low-priced integrated package. Novell's \$99 combination of word processor, spreadsheet, database, drawing and painting tools, and communications module provides all the power that standalone packages offered only a few years ago, but with vastly superior ease of use. It also includes a reduced version of Quicken (Intuit's personal financial planning package) that plugs into the toolbar.

Unlike the word processor in Microsoft Works, which has only a tiny subset of the features in Word for Windows, PerfectWorks supports many of the best features of WordPerfect. Misspellings are corrected on the fly; typographic quotation marks are inserted automatically; text wraps around irregular graphics; and file management features, complete with descriptively named directories, are accessible from every dialog box that opens or saves a file.

Some features even surpass WordPerfect's, like linked text frames that let text

SUITABILITY TO TASK		
PerfectWorks		
	Power	Ease
Formatting/layout	Good	Excellent
Composing/editing text	Good	Excellent
File management	Good	Excellent
User automation	Good	Fair

flow from one frame to the next, and an insert-symbol palette that can collapse to its title bar while remaining on-screen.

FAMILIAR LOOK

The interface shares many features with WordPerfect's, including a similar menu structure, a formatting toolbar, and two active status lines, one for fast changes to format, the other for fast movement around a file or for inserting fields with the date, time, or filename.

A separate floating icon palette provides quick access to simple drawing tools or inserts tables and graphics. The program allows you to edit different parts of the same file in separate windows, but because it lacks a draft mode, acres of screen space are wasted on top and bottom page margins.

Among the formatting tools are a dropper icon that copies paragraph formatting to other paragraphs. Named styles can be applied to characters, paragraphs, borders, and table cells, but paragraph styles do not include a keep-with-next option. Multiple columns can be inserted anywhere in a file—unlike with Microsoft Works, which uses a strategy of multiple columns to the entire file.

INCLUDED TEMPLATES

The package ships with a variety of document templates, but these rely on relatively primitive technology. They can automatically insert fields from the database module, but you have to edit each of the original templates by hand to replace generic strings like "Your Name or Organization." The envelope dialog includes an envelope catalog option that saves return addresses, mailing addresses, or both, but it won't find the address in a letter. An annotation tool adds sticky notes, and a menu option lets

you insert the filename into the text.

PerfectWorks lacks the dazzling automation of Microsoft Works, but you'll probably be happier with Novell's package if you prefer to build your own documents instead of using the ones that Microsoft provides. A Windows 95-specific version is due early in 1996, complete with integration into America Online as an alternative to Microsoft Works' inevitable integration with The Microsoft Network. **PerfectWorks 2.1.** List price: \$99; upgrade, \$34.95. Requires: 386-based PC or better, 4MB RAM, 8MB to 22MB hard disk space, Microsoft Windows 3.1 or later. Novell Inc., 1555 N. Technology Way, Orem, UT 84057; 800-451-5151, 801-226-6800; fax, 801-222-5077.

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MicroVision Development Inc.

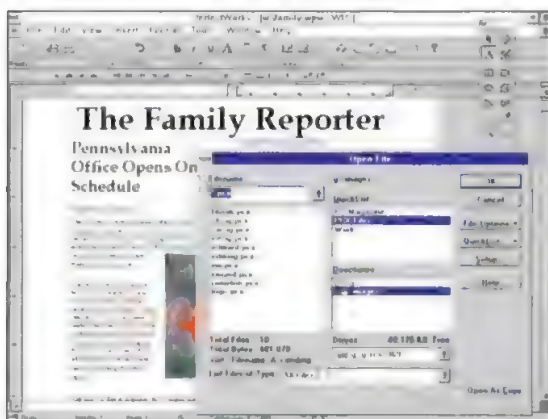
WordExpress

WordExpress, a \$49.95 Windows-based word processor from MicroVision Development, isn't an integrated package. Rather, it's a small word processor that can squeeze into 3MB of disk space and offer much of the power of full-scale programs in an easily navigated interface. Its small size makes it ideal for laptops, but its simplicity, convenience, and low appetite for Windows resources make it worth considering on desktop machines, too.

Unlike other low-priced programs, WordExpress is smart enough to find the address in a letter when you select the envelope feature from the menu. When you use its picture tool to draw a frame around a page for an imported image, the program immediately opens a dialog box in which you can select a graphics file. The drop-down font list includes the names of customizable character styles as well as individual fonts. The mail-merge feature merges both graphics and text.

You won't find footnotes, automatically inserted typographic quotation

SUITABILITY TO TASK		
WordExpress		
	Power	Ease
Formatting/layout	Fair	Good
Composing/editing text	Fair	Good
File management	Poor	Fair
User automation	Good	Fair



PerfectWorks 2.1 includes most of the file management features of WordPerfect for Windows. The QuickList gives access to directories or wildcard file specifications.

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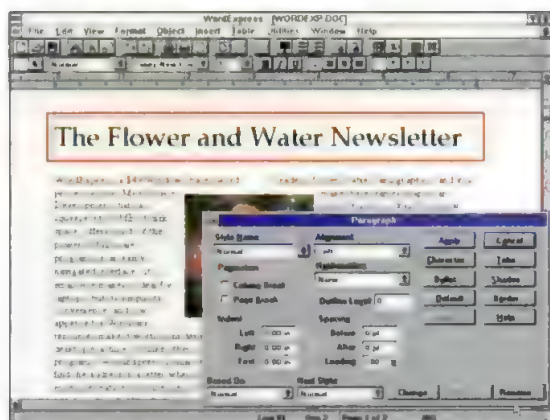
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COVER STORY
Word Processors



WordExpress supports a well-selected set of basic desktop publishing and word processing features through a clear, undistracting interface.

marks, or timed backups, but you'll find desktop publishing features that make it easy to create multiple columns, tables, and text and graphics boxes that can be rotated in 90-degree intervals.

WYSIWYG VIEW

The editing screen uses only a fully formatted WYSIWYG view, which you can

tioning by hand. The program somewhat awkwardly makes you switch manually between a text-insertion mode and an object-manipulation mode by right-clicking the mouse, clicking on a toolbar, or using a menu option.

Paragraph styles can include borders, shading, and initial bullets. Numbered lists are created through the unintuitive

zoom to from 30 to 400 percent. You can't hide the top and bottom margins, so a sentence that straddles a page break displays with a few inches of vertical space in the middle. The text at least jumps across the break quickly, without pausing to recalculate the screen display as many other programs do in similar situations.

WordExpress uses frames as containers for headers, footers, tables, and graphics, and you snap these frames to an invisible grid, or drag horizontal and vertical guidelines from the ruler onto the page for exact position-

ing by hand. The program somewhat awkwardly makes you switch manually between a text-insertion mode and an object-manipulation mode by right-clicking the mouse, clicking on a toolbar, or using a menu option.

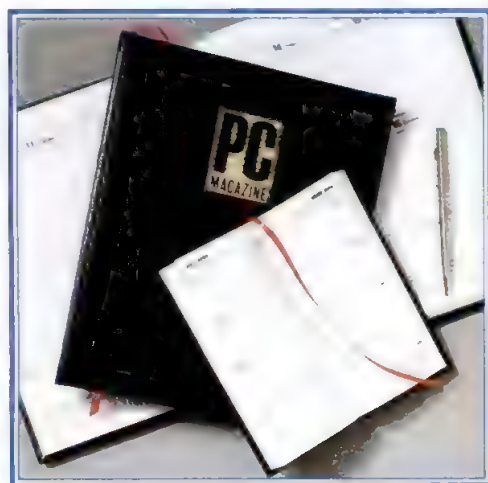
Paragraph styles can include borders, shading, and initial bullets. Numbered lists are created through the unintuitive technique of selecting the paragraphs and clicking on a numbering icon. If you insert a new item in the middle of the list you have to reselect the list and click on the icon again, but if you remove an item from the middle of the list, the remaining items renumber automatically.

The spell-checker includes an option to search the current frame or all frames, but you sometimes have to move the dialog box to see the misspelled word. A thesaurus and word count pop up at the press of a function key. The package includes 28 document templates. Although WordExpress is still in Version 1.1, it already has much of the finesse of larger and more mature programs, and in an age of sometimes incredibly bloated application software, its compact efficiency is as attractive as it is rare. □

WordExpress. List price: \$49.95. Requires: 4MB RAM, 3MB hard disk space, Microsoft Windows 3.1 or later. MicroVision Development Inc., 2185 Faraday Ave., #140, Carlsbad, CA 92008; 800-998-4555, 619-438-0305; fax, 619-438-7406. Circle 483 on reader service card

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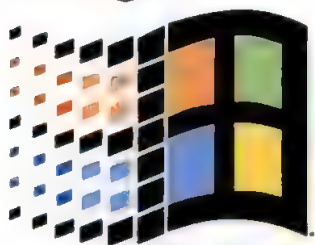
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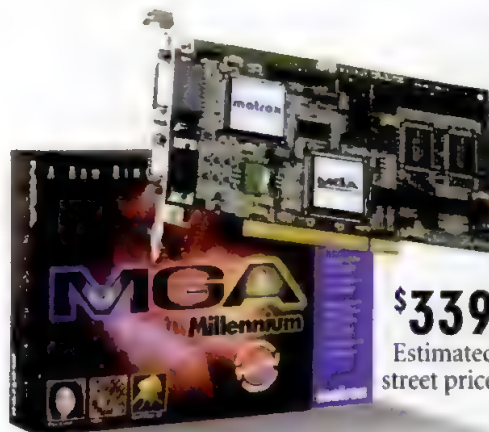
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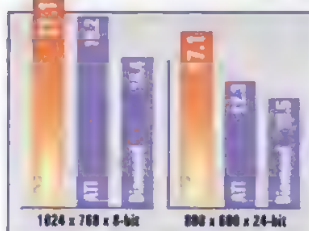
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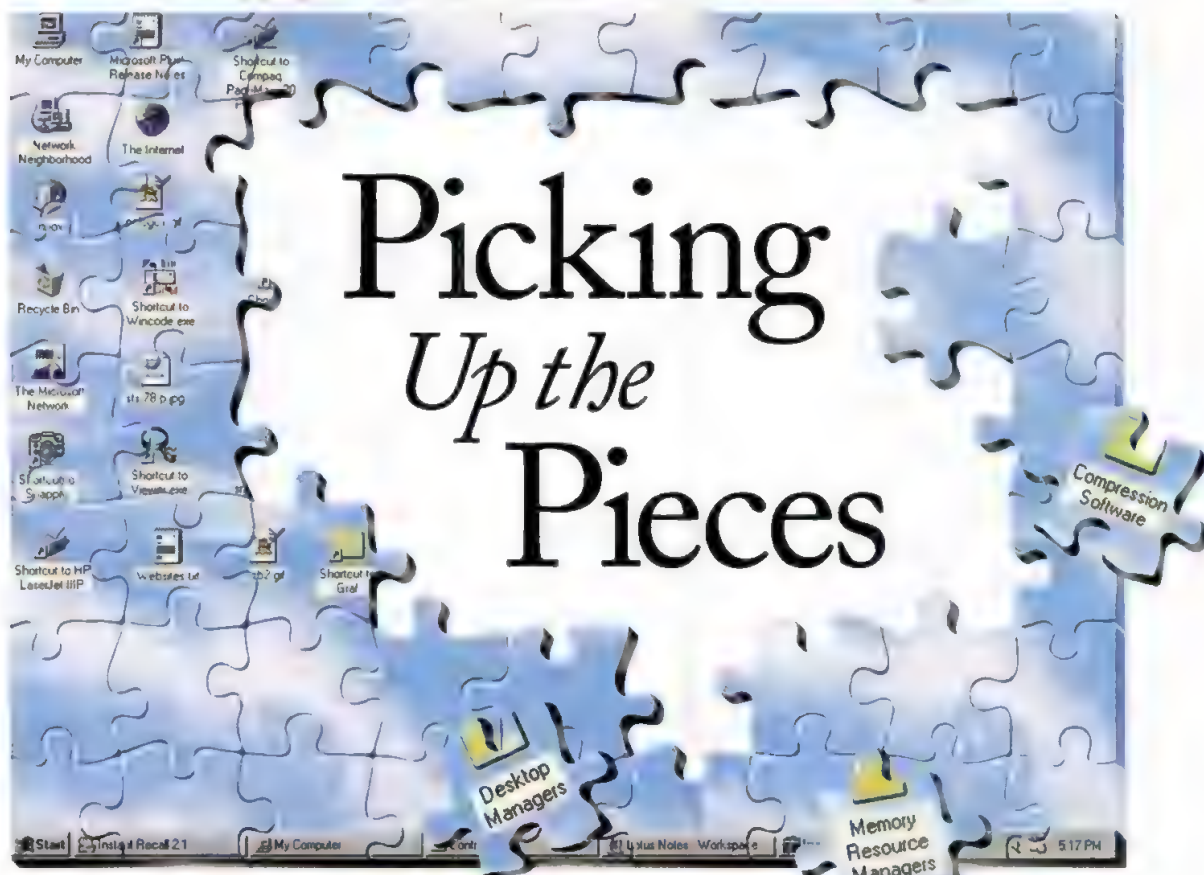
*Estimated street estimated selling price for the 2 MB version **Multimedia SuperPack available at MVA's Millennium mall, featuring only Windows 95 games from EA™ and published by MVA's Supermedia Group. ***Winbond WinBlast™ is a software program that enables the entire hard disk of a PC to be used as a cache for the system's RAM, increasing the speed of the MVA's Multimedia SuperPack multimedia playback video and A-Graphic software were achieved with 16MB of memory for the PD 500 series drive models 2.0 301, 4.30 301, and 8.30 301.



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WINDOWS 95 UTILITIES



Fear not, vendors are already rushing to provide the missing pieces for the Windows 95 utilities puzzle.

By Lance Ulanoff

When Microsoft shipped DOS 6.0 in 1993, some looked at its new built-in utilities and regarded them as a death knell for third-party utilities. But not everyone saw it that way. In fact, some utility vendors welcomed DOS 6.0 with open arms, saying competition would actually "grow" the market.

The release of DOS 6.2 brought more utilities and more fears. By that time, the utility market *had* begun to shrink. Microsoft ostensibly had little to do with it. One culprit turned out to be Symantec Corp., which gobbled up its two main competitors: Central Point Software and Fifth Generation Systems. Suddenly, shoppers had fewer choices when they went to buy backup, file-fixing, file-recovery, and file-management utilities.

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At the same time, the disk-compression industry was embroiled in a series of legal battles that left the future of DOS's DoubleSpace and Stac Corp.'s Stacker in doubt. Other disk compression competitors stood by and waited for the dust to clear, and a few left the business.

With the release of Windows 95 this past August, the utilities market has taken yet another turn. Some of the utilities you may have come to depend on under DOS 6.x—memory management and virus detection and removal—aren't included in Windows 95, while others, such as disk defragmentation and disk compression, have been updated. Windows 95 has backup features, though they're somewhat limited. In addition, the Microsoft Plus package adds yet another compression choice as well as system agents to manage all the messy details of disk maintenance.

Where does this leave the competition? In areas where Windows 95 has little or nothing to offer, it's open season. Virus detection and backup, in particular, may enjoy a resurgence. Symantec has solutions in both of these areas, but only Symantec and Starfish Software are trying to market utilities to alter Windows 95's brand-new interface.

Currently, the only full-fledged 32-bit utility collection available for Windows 95 is Symantec's Norton Utilities. It contains many of your favorite and familiar chestnuts such as Speed Disk, UnErase, and the emergency recovery disk. A couple of Windows 95-specific features have been added as well. These include the preinstall tune-up to help you prepare for the big Windows 95 upgrade and Space Wizard tools to help reduce file redundancy and open hard disk space prior to and after installing Windows 95.

The following roundup makes it clear that utilities development efforts for Windows 95 are alive and kicking, but whether all these categories can remain viable under the new operating system remains to be seen.

Our Contributors: SHERYL CANTER and CRAIG STINSON are contributing editors of *PC Magazine*. JOEL T. PATZ is a freelance writer, and DAVID HASKIN is a frequent contributor to *PC Magazine*. LANCE ULANOFF was the associate editor in charge of this story, and JAY MUNRO was the project leader.

Highlights: The Windows 95 Utilities Market

Desktop management

Compression



Windows Explorer offers such file-management features as the ability to find duplicate files and a compare-folder command. Desktop customization and application-launching features include the abilities to create ad hoc program groups and shortcuts.



It offers **Themes**, which let you customize your desktop. Each one includes a collection of icons, fonts, wallpaper pictures, sounds, and iconic animation.

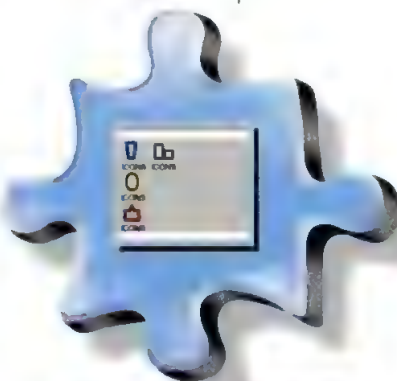


Starfish Software's **Dashboard 95** provides for multiple desktops, has a system resource meter, and offers such program management features as a Quick Launch utility. Symantec Corp.'s **Norton Navigator**, which replaces the Norton Desktop, offers desktop customization and the Norton File Manager. The Navigator includes such features as file compression, undelete and encryption, access to FTP sites, and a Uu-Encode and -Decode utility.

DriveSpace 2 is built-in. With DriveSpace 2 you can create compressed drives of up to 512MB by compressing up to 256MB at a time.

It includes **DriveSpace 3**, with which you can create compressed drives of up to 2GB by compressing up to 1GB at a time.

Stac Electronics' **Stacker, Version 4.1**, is a 16-bit, Windows 95-compatible application that offers real-time, lossless compression. Performed slower than DriveSpace on our tests.



Desktop Managers

ALL REVIEWS BY CRAIG STINSON

For the vast majority of us, Windows 95's new interface is an unadulterated packet of good news. Microsoft has finally done away with its ungainly File Manager (and introduced the Windows Explorer), given us the ability to nest folders within folders, designed a simpler way to launch programs and reopen documents, imple-

mented an unobtrusive task-switching mechanism, and added dozens of other conveniences that make Windows easier to learn and a more efficient operating environment.

But is this good news for the makers of Windows File Manager replacements and shell utilities (now referred to as Desktop Managers)? Sure, the population of Windows users is going to be even bigger than before, providing an ever-larger market for third-party system tools. But with all of Windows 95's improvements, will demand continue for products that provide makeovers to the standard Windows interface or enhancements to the document- and program-management services provided by Windows 95?

Yes, without doubt. A brilliant user-interface design achieves a large measure of both power and accessibility by making the system versatile as well as easy to master. But at some point, added power un-

Antivirus	Backup	Memory management	Resource management
There is some built-in protection. For example, it blocks any virus that tries to write to the hard disk directly. The OS keeps a list of the current INT 13 hooks and MS-DOS device drivers and alerts you when an unknown or new file appears at INT 13 or as a driver. Microsoft Plus adds or offers nothing new for this utility category.	Windows 95 has a backup applet, but the utility doesn't support SCSI devices. Microsoft Plus adds or offers nothing new for this utility category.	Memory management in Windows 95 is an issue only if you're loading real-mode DOS drivers or using large DOS applications. Windows 95 does not include MemMaker, but it will move your current version (the one found in DOS 6.2) to the Windows directory. Microsoft Plus adds or offers nothing new for this utility category.	The OS includes a Resource Meter, which shows the amount of free USER and GDI resources. It includes a System Monitor, which shows on-screen, real-time displays for about 24 different types of information such as current swap-file size and CPU usage. Microsoft Plus adds or offers nothing new for this utility category.
S&S Software International's Dr. Solomon's Anti-Virus Toolkit has a Virus Encyclopedia, which describes viruses. Symantec Corp.'s Norton Anti-Virus for Windows 95 provides Auto-Protect and Start-Up scans for extra security. Touchstone Software's PC-cillin 95 will scan files as you download from the Internet and on-line services. ThunderByte's ThunderByte Anti-Virus Utilities for Windows 95 only detects viruses. McAfee Associates' VirusScan for Windows 95 applies analytical techniques to ferret out suspicious activity.	Arcada Backup for Windows 95 supports common device types, including most SCSI devices. It also has long-filename and Plug and Play support. Colorado Memory Systems' Colorado Backup for Windows 95 supports its own tape drives as well as some Hewlett-Packard models. Novastor's NovaBack for Windows 95 and Windows NT supports only SCSI tape drives.	Helix Software's Netroom 3.04 moves the system and video BIOS into extended memory. Quarterdeck's QEMM 7.5 moves the system and the video BIOS into expanded memory. Qualitas's 386MAX 7.02 aggressively exploits unused addresses in upper memory. All three companies are working on Windows 95 versions of their memory management products. They are all expected to add resource-management techniques, as well.	Quarterdeck's MagnaRAM 2 is a RAM multiplier. It compresses the data in Windows stores in RAM, so swap-file activity is lessened. It also provides some memory status details. Synchrony Software's SoftRAM 95 for Windows 95 is another RAM multiplier. SoftRAM 95 lists memory-status information in detail.

avoidably comes at the price of increasing complexity. Late in the Windows 95 beta cycle, Microsoft removed a number of valuable features from the product's Exchange Inbox, ostensibly because a large number of beta testers found those features bewildering.

What emerged from Redmond this past August, therefore, embodied Microsoft's best estimates of the needs and skills of average computer users. It may or may not be an accurate assessment of your abilities and predilections. Just in case Microsoft overlooked any features that you might welcome, two of the major utility vendors from the Windows 3.1 era have already stepped up with offerings for Windows 95. Others will be along in due time.

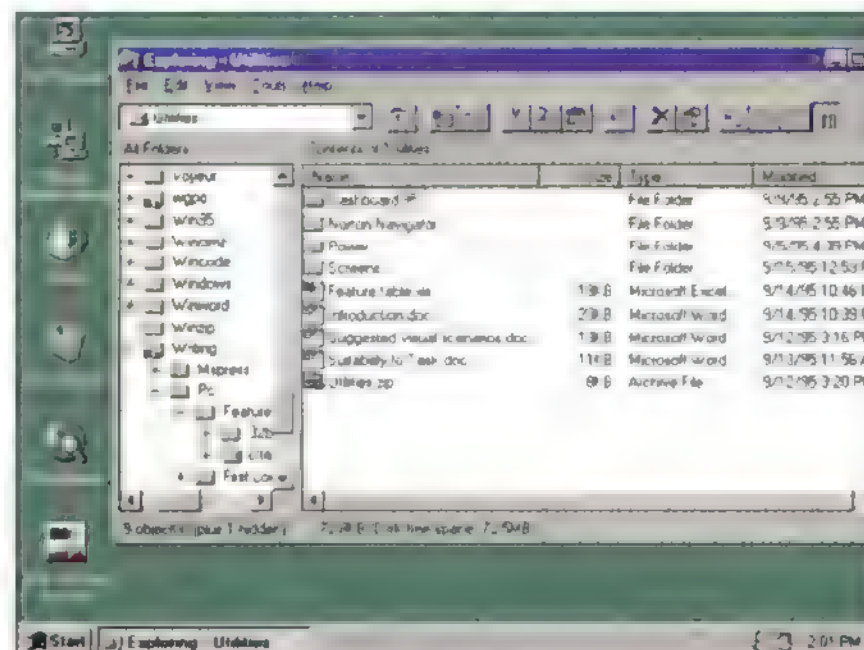
FIRST IN ATTENDANCE

The first two shell utilities, reviewed on the following pages, are Starfish Software's Dashboard 95 and Symantec's Norton Navigator. Dashboard 95, which

runs in both Windows 95 and Windows NT, is the follow-up to Dashboard 3.0, a product that began its life at Hewlett-Packard, was subsequently acquired by Borland, and eventually accompanied Philippe Kahn when he founded Starfish Software. Norton Navigator is the Windows 95 successor to The Norton Desktop for Windows and PC Tools for Windows, both of which Symantec will continue selling in the Windows 3.1 marketplace. (Symantec says it has other utilities under development for Windows NT; Norton Navigator does not run in Windows NT.)

One important thing to note about both Dashboard 95 and Norton Navigator: Unlike their predecessors, these products are designed not to bury the standard Windows user interface but to augment it. If you

adopted Dashboard 3.0 or The Norton Desktop for Windows under Windows 3.1, you probably used that product in place of Program Manager. In Windows 95, with Dashboard 95 or Norton Navigator installed, you will still have a Start menu, a Taskbar, a Network Neighbor-



The Windows Explorer is a vast improvement over the Windows 3.1 File Manager.



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Desktop managers:

Norton Navigator

If you feel you're not getting everything you need out of Windows 95 and the new Windows Explorer, then our Editors' Choice for Desktop Managers, Norton Navigator, will help you fill in the blanks with features

such as file compression and viewing, Uu-Encoding and -Decoding, FTP awareness, and more.

In the sparse category of Desktop Managers, you have three choices. One, you can stick with standard Windows 95 (clearly an improvement over Windows 3.1). Two, you can try the Program Manager replacement Dashboard 95 (a product that, in the absence of Windows 3.1 Program Manager, seems like a tool with diminished purpose). Or three, you can soup up Windows 95 with Norton Navigator. If you perform a lot of file management tasks, the choice is obvious. Whereas Dashboard 95 neither replaces nor refines the Explorer, Navigator adds a feature-complete alternative in its own File Manager.

Some people say that when you buy

Disk compression:

DriveSpace 3

Microsoft Plus, you get a lot for your \$49. Others believe that the themes, games, and special utilities should have been part of standard Windows 95 in the first place. In either case, DriveSpace 3, the compression utility bundled inside Microsoft Plus, is worth having and currently a better choice than either DriveSpace 2 (bundled with standard Windows 95) or Stacker, Version 4.1.

DriveSpace 3's 32-bit architecture and effective compression scheme helped it outperform in speed DriveSpace 2 by a small margin and Stacker 4.1 by a somewhat larger one. Comparisons with Stacker, though, remain somewhat unfair. This 16-bit application seems downright sluggish when compared with either 32-bit DriveSpace application (Stacker took 15 to 19 percent

longer on our decompression tests). More important, Stacker's future remains in doubt, though we believe there may be another version of Stacker somewhere on the distant horizon.

The last point is an important one if you're a current Windows 3.1 Stacker user. You're likely trying to decide whether to upgrade to Windows 95 and to Stacker 4.1 (which does at least run under Windows 95 and support Windows 95's long filenames and folder names). If stability is a concern, you can probably upgrade without worry. But if you're ready to upgrade to Windows 95 and want to add the powerful disk compression found in Microsoft Plus and DriveSpace 3, then we say, "Go to it."

As for DriveSpace 2: As a Windows 95 user you will only have to decide whether or not to use it. But DriveSpace 2's 256MB partition limit, lower compression ratios, and slower decompression rate may leave you itching for the real thing.

We chose not to award Editors' Choices for backup or antivirus software, because too many of the products were in prerelease versions at the time of our reviews.

hood icon, a Recycle Bin, and all the other regular Windows 95 user-interface components. The utilities will simply provide alternative ways of accomplishing routine tasks.

What kinds of tasks and alternatives? Here's a sample: Shortcuts in Windows 95 give you a way to create ad hoc groupings of programs and documents that don't necessarily reside in common file

will populate a portion of their desktops with shortcuts to whatever folders, files, and programs they are working with the most.

All well and good, but your desktop has a fixed capacity, and there's no simple way to organize meaningful groups of shortcuts on the desktop. You can create new desktop folders and collect related groups of shortcuts in these folders. But that process is less intuitive than you might like.

In Dashboard 95, you can use drag-and-drop to gather related programs and documents into Quick Launch groups. Each Quick Launch group gets a named tab on a Quick Launch panel, which can be "snapped off" the main dashboard to float or dock against a desktop edge. To run a program or open a file, you click once on the Quick Launch group tab, then a second time on the program or document icon.

In Norton Navigator, you can use a wizard to create "smart folders." For ex-

ample, you might set up such a folder for all spreadsheet documents on any local hard disk that you have used within the last ten days. You could also stipulate that the folder include word processing documents stored in a particular directory.

Obviously, in order to use either of these products, you have to choose Windows 95 first. Whether you choose to stick with vanilla Windows 95 or pour Dashboard 95 or Norton Navigator syrup on top of it is another matter.

Starfish Software

Dashboard 95

Starfish Software's Dashboard 95 is based on a simple metaphor. As the dashboard in your car provides a set of gauges and switches that you use to drive and monitor your automobile, so the dashboard on your screen presents meters, buttons, icons, and tear-off palettes, all for the purpose of helping you



SUITABILITY TO TASK

Microsoft Windows 95

	Power	Ease
Application and document launching	Good	Good
File management	Good	Good
Desktop customization	Excellent	Excellent

directories. Because shortcuts are small-footprint pointers to larger disk objects, you can put them anywhere and copy them at will without eating up much disk space or disturbing the basic organization of your disks and directories. Many users

"drive" Windows 95 (or Windows NT) and monitor what's going on as you do so.

By using small icons and buttons, Dashboard 95 crams an amazing number of controls into a window, which by default covers the full width and about a quarter of the height of a standard VGA screen. Most of this window is made up of nine modular panels. You can rearrange the panels to suit your preferences and hide any that don't prove to be worth their allotment of desktop space. You can similarly customize the Windows 95 interface with Norton Navigator, the other desktop management tool reviewed here. But unlike Navigator, Dashboard 95 doesn't offer any alternatives to the Windows Explorer and its file management abilities.

Dashboard 95 is also extensible. By writing to Starfish's API, anyone proficient with a 32-bit compiler can create custom panels.

ON-BOARD

Dashboard 95's standard panels are called Quick Launch, Win Tools, Resources, Clock/Calendar, Printers, Extended Screens, Games, Programs, and Taskbar. In addition to these panels, miniature buttons let you tile and cascade your open windows, invoke a Run command (which includes a drop-down command history as well as a window for displaying the output of DOS commands),

and relaunch previously saved arrangements (layouts) of windows. A right click on Dashboard 95's title bar brings up a Customize dialog box, where among other things, you can adjust panel positions, fonts, and colors; switch the Dashboard 95 window between horizontal and vertical orientations; assign hotkeys to programs; and turn Dashboard 95 into a stay-on-top window. Right-clicking particular panels lets you do such things as opt for larger icons if you find the miniatures too small for comfort.

With additional buttons, you can "snap" off certain panels (Programs, Quick Launch, Printers, and Taskbar) from the mother ship, either to float freely on your desktop or to dock against a screen edge. Docked panels can be set to auto-hide: A panel can be made invisible until you pass the mouse over the space where it's docked.

A QUESTION OF VALUE

As a Windows 3.x shell replacement, Dashboard 95's immediate predecessor offered an extremely efficient alternative to Program Manager. Under Windows 95,



Dashboard 95 packs a lot of controls into a small window. Some of those controls merely mimic controls that are already part of the Windows user interface.

however, the increment of value added is less impressive. Some panels are unequivocally useful, while others have begun to look more like gadgets than tools.

As an example of the former, the Quick Launch panel offers functionality not conveniently available in Windows 95. Simple mouse maneuvers let you create named groups of applications and documents, helping you to make everything related to your current project accessible from a single location. Dashboard 95 even offers to analyze your system and put functionally related programs (all your graphics tools, for example) together into a set of Quick Launch groups when you first set up the utility.

The Extended Screens panel lets you

DESKTOP MANAGERS

Suitability to Task

Products that rate highly on our **Application and document launching** task extend Windows 95's drag-and-drop abilities and automate the job of opening multiple applications and documents.

File management looks at the features that let users view and manipulate files, directories, drives, external disks, and CD-ROMs. Here, we also rate file association, compression, and viewing abilities.

Our **Desktop customization** task examines how users can adjust, switch, move, and add components to their desktops. In addition, it addresses

SUITABILITY TO TASK		
Product name		
	Power	Ease
Application and document launching	Poor	Poor
File management	Fair	Fair
Desktop customization	Good	Good

how easily users can add and delete menu choices, and how they can group files and applications. Uninstall features also figure here.

We rated each product on three tasks: application and document launching, file management, and desktop customization. Each task has scores for power and ease.

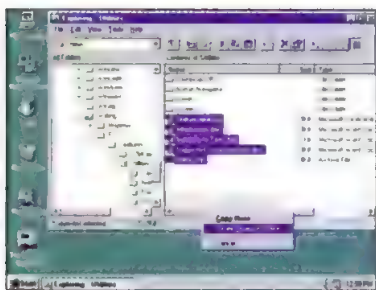
The **Ease** ratings indicate the simplicity and intelligence of the interface design as well as task automation tools.

The **Power** ratings address the depth of file management and interface-control features. More specifically, they focus on the extent of tools for managing and organizing files and desktop elements and how well these tools are integrated in the desktop management product.

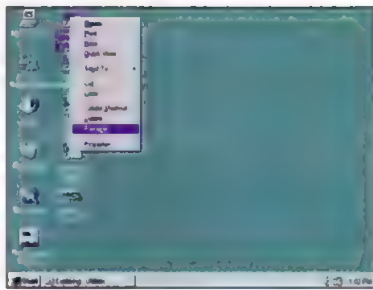
Step by Step: All Roads Lead to Home

Starfish Software's Dashboard 95 and Symantec's Norton Navigator are more than just Windows dressing. They each apply new metaphors to the way Windows 95 works. What follows is an illustrated look at how these two products and the undressed Windows 95 handle the task of creating a set of quick-launch shortcuts for all the files you're working with on a current project.

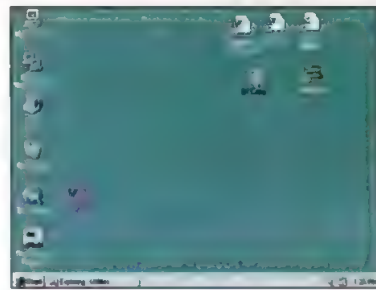
Windows 95



Step 1: Select files in a folder window, right-click to the desktop, and choose *Create Shortcut(s) Here*. Repeat for each folder that has the files you need.

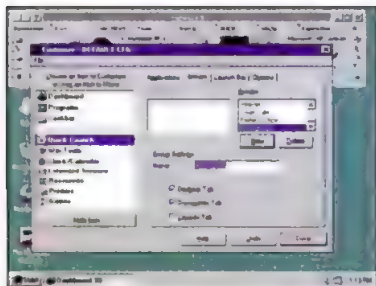


Step 2: Right-click each new shortcut in turn, choose *Rename*, and shorten the default names so they don't overrun your desktop.

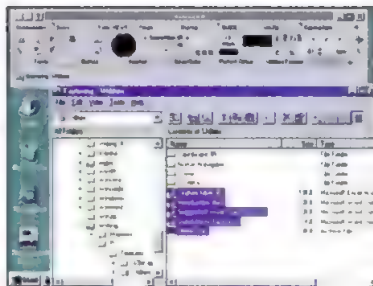


Step 3: Use drag-and-drop to organize your new shortcuts so you can find them quickly when you need them.

Dashboard 95



Step 1: Right-click the title bar, choose *Quick Launch*, the *Groups* tab, and *New Group*, and type a name for your new group.

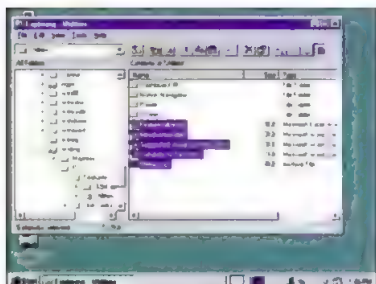


Step 2: Select files of interest in a folder window and drag them to the appropriate tab in Dashboard's *Quick Launch* panel.



Step 3: Select your *Quick Launch* group and click on the icon for the document or program you want to launch.

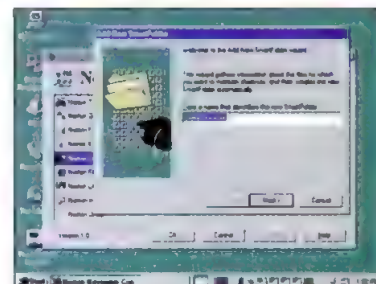
Norton Navigator



Step 1: You can select files of interest in a folder window and drag them to the Taskbar, dropping them just to the left of Norton Navigator's notification area.



Step 2: On the right side of the Taskbar, find the icon for the program or document you want to launch (using *Tool Tips*), then click once.



Step 3: Alternatively, use Norton Navigator's *Smart Folder* wizard to create folders of shortcuts for particular file sets. Let the wizard automatically keep your folder up to date as you work.

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work with up to nine virtual desktops—which is convenient if you like to run so many windows at once that the screen clutter gets distracting. The Clock/Calendar panel, similarly, takes you beyond native services by letting you set alarms. You can even use the alarms as automatic triggers for launching applications. The panel is by no means as versatile as Microsoft's System Agent (included with Windows Plus), but it's nice to have.

On the other hand, the Programs panel, which recreates the Programs section of your Windows Start menu, is pure redundancy. The Resources panel, while fun to watch, is a modest benefit at best (do you really need to know how many threads you have running?). And the Win Tools panel's one-click access to Explorer and Control Panel just doesn't seem worth the screen space required to provide it.

If you're accustomed to running Windows via Dashboard 3, Dashboard 95 can certainly ease your transition to the new platform. If you're working in Windows NT under Windows NT's current user interface, this is still a product you can get excited about. For new users running Windows 95, Dashboard 95's value is marginal.

Dashboard 95. Estimated street price: \$49.95. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 95 or Windows NT. Starfish Software, Scotts Valley, CA; 800-765-7839; fax, 716-873-0906.

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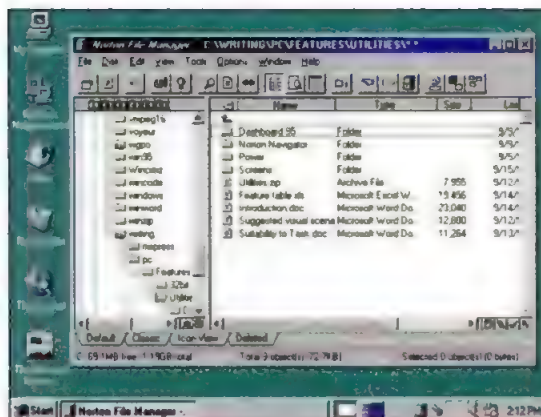
Symantec Corp.

Norton Navigator



Symantec Corp.'s Norton Navigator is a catalog of good ideas about how the improved Windows user interface can be further improved.

Norton Navigator's centerpiece is the Norton File Manager, a souped-up Explorer that provides a host of file and directory management services that are not available in the native item. The File Manager by itself would fully justify Navigator's \$99 estimated street price. But along with the File Manager, you get a basket of intelligent improvements to other components of the Windows 95 user interface: a better



Norton Navigator's Explorer alternative manages FTP sites as well as local directories, lets you compress, encrypt, Uu-Encode, and undelete your files, and offers many more viewing options than the standard Explorer.

Documents command, a better Run command, direct access to individual Control Panel applets, a streamlined method of navigating through nested folders, a multiple-level Undo command, and more.

The utility set is modular. If you

*Norton Navigator's
File Manager is
designed as an
alternative to Explorer,
not a replacement
for it.*

choose to run the whole works, you will find new commands on your shortcut menus, modified commands on your Start menu, and a Taskbar that is split into two panes, the right side serving as a switcher between your virtual desktops and as a repository for QuickLaunch shortcuts (see the sidebar "All Roads Lead to Home"). Your system will also take a moment or two longer to get started in the morning. You can use a Control Center applet to unload any components of the utility set that you find unhelpful or obtrusive.

MANAGED CHOICE

The File Manager is designed as an alternative to Explorer, not a replacement for it. Unless you change the folder/file-type association, your folders will still open into normal folder windows or Explorer views. That's as it should be, because the File Manager, with its extra facilities, is somewhat slow on-screen and is a visually busy assemblage of buttons, tools, and menus. A QuickLaunch button, installed on the Taskbar by default, gives you one-click access to the File Manager when you need it.

The File Manager provides a number of valuable viewing options. You can display all files in a tree branch, for example, and add columns to indicate the last-accessed date and parent folder. You can choose an outline mode, in which your files are grouped by extension and summarized by expandable category headings. You can also display the names and stats of deleted files and quick-view them if they have not been overwritten. If a deleted file is resurrectable (either because it's still in the Recycle Bin or because it hasn't yet been overwritten), you can bring it back to life with a double click. You can assign a name to any constellation of viewing options and return to that view by clicking a tab at the bottom of the File Manager window.

You can even use the Norton File Manager to view and manipulate the contents of FTP sites as though they were local disk resources. Assuming you have Internet access via WinSock 1.1 or above, you can connect to an FTP site directly from within the File Manager.

By selecting particular files and choosing menu commands, you can com-

press or expand, Uu-Encode or Uu-Decode, encrypt or decrypt those files. The Uu-Decoder handles split downloads transparently, and the encryptor—

while it is not the thing to foil a professional sleuth with—is adequate to shut out your kids and cohorts.

SUITABILITY TO TASK

Norton Navigator

	Power	Ease
Application and document launching	Excellent	Excellent
File management	Excellent	Excellent
Desktop customization	Excellent	Excellent

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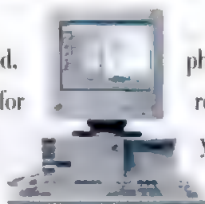
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AND MORE...

Further file management tools include a File Archive wizard that seeks out the moldy residue of ancient tasks and projects and, at your discretion, moves, deletes, or compresses any such items it finds. There is also a full-text indexing service that helps you locate files by their contents, a wipe-delete command for shredding sensitive data, a tag mode that lets you apply commands to files in multiple folders, and commands for comparing and synchronizing disks or directories.

With a Navigator command added to the folder shortcut menu, you can right-click any folder icon and follow a set of cascading menus to get to a distant subfolder. The only imperfection in this fine idea is that the goal of your traverse has to be an ordinary folder window, not an Explorer view.

With Norton Navigator installed, you get superb file management and an all-around smarter operating system.

With long-filename support installed, Norton Navigator modifies the common dialog boxes (Open, Save, Save As, and Browse) used by older applications. The letters LFN appear to the right of the filename text box, indicating that you can enter a long filename. The program automatically appends the expected filename extension at the end of whatever you type.

The bottom line: With Norton Navigator installed, you get superb file management and an all-around smarter operating system.

Norton Navigator. Estimated street price: CD-ROM or floppy disks, \$99. Requires: 4MB RAM, 6MB disk space, Microsoft Windows 95. Symantec Corp., Cupertino, CA; 800-441-7234, 503-334-6054; fax, 503-334-7474.

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Hard Disk Compression

ALL REVIEWS BY SHERYL CANTER

Disk compression is a technology that increases the apparent capacity of hard disks by storing the hard disk contents in a compressed form and then decompressing and recompressing the data as needed. Processing occurs invisibly. The time it takes to compress and decompress can slow performance, but the hit is small and not generally noticeable. Although the risk is minimal, disk compression does give your data more ways to go wrong. The best disk compression utilities provide maximum data compression and the smallest performance hit and contain features and redundancies to prevent data loss.

When disk compression first appeared as part of DOS 6.0, its appearance caused a lawsuit between Microsoft and Stac Electronics, makers of the disk compression utility Stacker. Microsoft had licensed DoubleDisk from Vertisoft and replaced the software's mathematical compression engine with an engine similar to Stacker's. Stac felt this constituted patent infringement. Stac was awarded damages, and Microsoft DoubleSpace was pulled from DOS and replaced in Version 6.22 with DriveSpace. The first implementation of DriveSpace didn't compress as well as Stacker. The new incarnations, DriveSpace 2 and DriveSpace 3, which come with Windows 95, have been tuned to perform competitively. The only third-party vendor with a Windows 95 compression product at the time of this writing is Stac.

All versions of Windows 95 come with DriveSpace 2, which can compress drives of up to

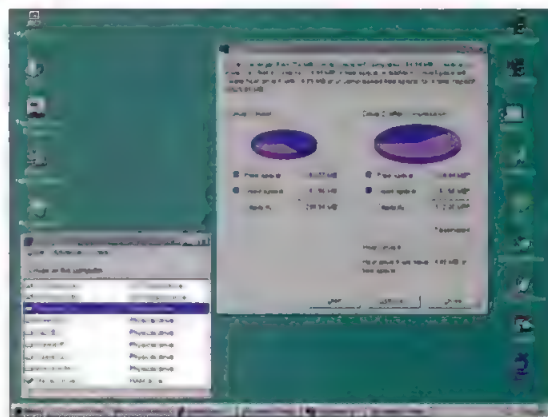
256MB for a compressed size of 512MB. If you buy Microsoft Plus, you'll get DriveSpace 3, which can create compressed drives of up to 2GB and offers higher compression ratios.

HOW DISK COMPRESSION WORKS

Disk compression utilities take all the data on a hard disk partition, compress it, and store it in a big file called a compressed volume file (CVF). The CVF is usually stored on a separate, virtual drive, called the *host drive*. A driver loaded prior to CONFIG.SYS makes the CVF look like a hard disk to the operating system.

Disk compression utilities generally use a compression scheme called LZW, which uses a one-pass algorithm suitable for real-time processing. Compression works by coding the information in a way that takes less space in most of the types of files found on a hard disk. LZW creates the encoding dictionary on the fly, during both compression and decompression, and adjusts the coding scheme as it goes along to maximize the compression rate.

On decompressed disks, the smallest unit that can be allocated is a cluster. The size of the cluster—the number of 512-byte sectors it contains—depends on the size of the hard disk. Larger hard disks require larger cluster sizes. This is because the file allocation table (FAT) can have only 65,536 entries, each entry being a cluster. A 4K cluster consists of 8 sectors and can address 4K times 65,536 hard disk space (256MB). Similarly, a disk up to 512MB requires 8K clusters; a 1GB disk



DriveSpace 2, like the previous version of DriveSpace, cannot compress more than 256MB at a time.

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requires 16K clusters; and a 2GB disk requires 32K clusters. Even if the end of a file doesn't use up all of the last cluster, the entire cluster is allocated, and the extra space is wasted.

Another way disk compression utilities reduce the space taken up on-disk is to allocate space in sector units or smaller, rather than clusters. This reduces the unused space between files. Stacker uses 16-byte units; DriveSpace 2 uses sectors (512-byte units). DriveSpace 3 uses 32K clusters. The CVF has some special structures in addition to the FAT for addressing allocation units smaller than clusters.

SOME CAUTION

Because the data is both compressed and stored differently, there is more potential for things to go wrong. For this reason, disk compression software is among the most thoroughly tested software on the market and is designed with self-test features and redundancies that can correct almost any problem.

Defragmenting your CVF periodically keeps your compression rate and free disk space high. The amount of free space shown with a DIR command is based on the estimated compression rate for that drive. The actual compression rate can shift from the estimate over time as the CVF becomes fragmented. To get an accurate idea of how much disk space you really have, periodically reset the estimated compression ratio to match the actual rate. After defragmenting your disk, you should always update the estimated compression ratio.

If you're using disk compression, you'll need disk management tools that are compression-aware. Standard defragmentation software works at the cluster level, but fragmentation in compressed drives occurs at its smaller unit of allocation. Make sure your disk utilities are compatible with the compression software you're running on your system. Backup of compressed drives is another issue. You need to use backup software that copies data at the file level rather than creating a disk image.

Because both versions of DriveSpace are so similar (with the exception of performance), they're covered together in the following review.

Microsoft Corp.

DriveSpace 2, DriveSpace 3



The standard version of Microsoft Windows 95 comes with a disk compression utility, DriveSpace 2, which uses moderately effective compression techniques and can create a compressed drive of up to 512MB.

Microsoft Plus comes with an enhanced version, DriveSpace 3, which can compress up to 2GB at a time and offers a higher compression rate. The interface is basically the same for both. When you install Microsoft Plus, DriveSpace 2 is overwritten.

Since the Windows 95 versions of DriveSpace are 32-bit applications that recognize long filenames, they both outperform Stacker 4.1, which is a 16-bit applica-

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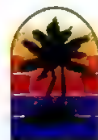
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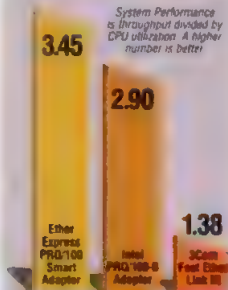


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Benchmark Tests: Disk Compression Software

What the Numbers Mean

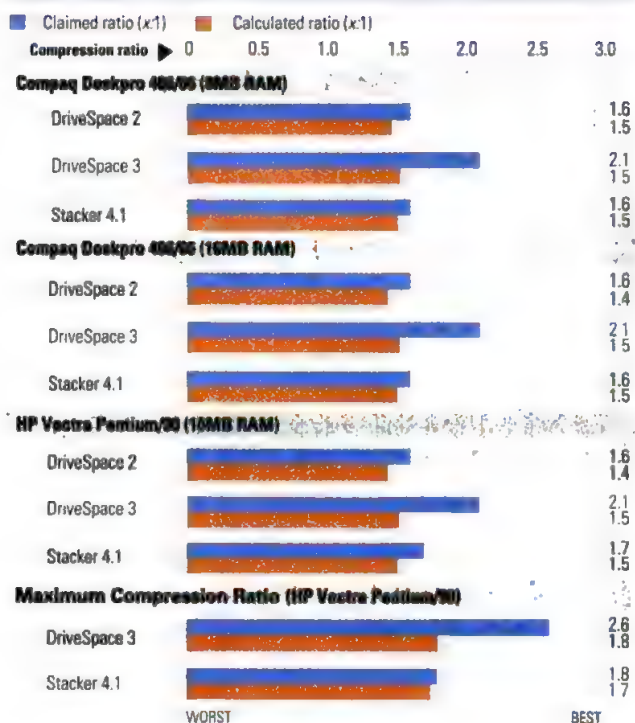
We expected that the protected-mode, 32-bit Microsoft DriveSpace 2, which comes with Windows 95, would be faster than the real-mode, 16-bit Stacker, Version 4.1. We also expected that because DriveSpace 3 (which comes with Microsoft Plus) does more work than DriveSpace 2, it would be slower. There were no surprises on these counts. What did surprise us was how close to the speed of an uncompressed drive the products performed. DriveSpace 2, with its standard compression (which tested at about 1.4 to 1), turned in the fastest time, with only a 3 percent degradation on the Pentium. On the 16MB Compaq 486, degradation was around 5 percent. On the Pentium, Stacker lost about 19 percent compared with the uncompressed disk and did slightly better, at 15 percent, on the 16MB Compaq 486. (Our Winstone tests didn't work when Stacker was installed on the 8MB Compaq 486.)

We got consistently lower numbers than the utility vendors advertised when we calculated compression ratios ourselves. This difference is a result of the fact that we used the actual bytes reported by the DIR command, rather than the number of sectors per file, which incorporates "padding" based on the sector or cluster size.

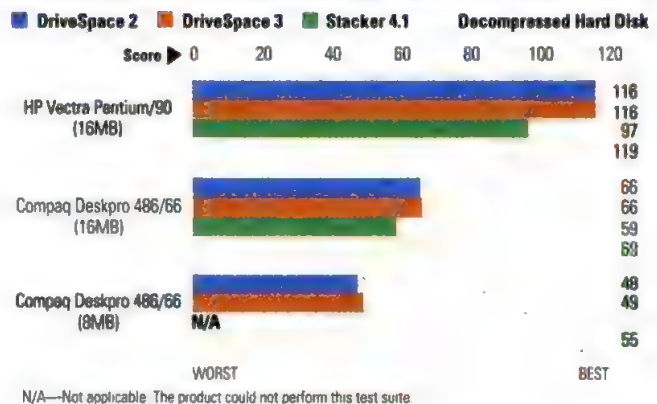
DriveSpace 3 and Stacker both let the user tune the compression. DriveSpace 3 had the best compression, at 1.8 to 1 for our calculated results. Stacker came in at 1.7 to 1 in our calculations. One caveat: Compression ratios and performance vary greatly depending on file type.

—Analysis written by Jay Munro

COMPRESSION RATIOS



WINSTONE 95



N/A—Not applicable. The product could not perform this test suite.

How We Tested

To test compression software, we used three setups: a Compaq Deskpro 486/66m with 8MB of RAM, a Compaq Deskpro 486/66m with 16MB of RAM, and a Hewlett-Packard Vectra XU 5/90 Pentium with 16MB of RAM. To test performance, we used PC Labs' Winstone 95. Winstone 95 is a series of tests using 13 major applications, and it simulates the processes that a real user would perform. For DriveSpace 2 and DriveSpace 3 testing, we installed Windows 95, selected the compression options, and then compressed the C: drive. In our first installation of Stacker, we installed Windows for Workgroups on a machine, then installed Stacker and compressed the C: drive. When we upgraded to Windows 95, we found that some files were corrupted in the process, and the system froze. After a tech-support call to Stac, we wiped the drive and reinstalled and were able to get a working system. We also found that when decompressing a large hard disk (540MB), Stacker reported an out-of-memory error and could not continue. Technicians at Stac confirmed the problem (and are working on it) and state that the problem arises because Stacker uses real (640K) memory to store information during decompression, and it runs out on large hard disks. For subsequent testing, we started with a clean Windows 95 system and then installed Stacker, which worked without a problem. All performance testing was done with default installations.

For compression-ratio testing, we used the same system but created a separate 70MB partition (physical size) with each system. To emulate what a typical user might have on a system, we installed Winstone 94 on the drive. Winstone 94, unlike Winstone 95, installs decompressed applications on the drive when you do a full installation. After installing Winstone 94, we ran a filler program that created subdirectories and copied a selection of files from the decompressed drive into the new directories. The file selection was made up of EXEs, DLLs, bitmaps (.BMP, .ICO, .TIFF), .DOC, .WAV (sound), vector graphics (.DWG), and .ZIP files. The program continues to create subdirectories and copy files until it runs out of space. For the default installations, the filler program stopped with up to 1MB free, a situation that users will often see. Once the drive was effectively full, we calculated the actual compression ratios with the formula

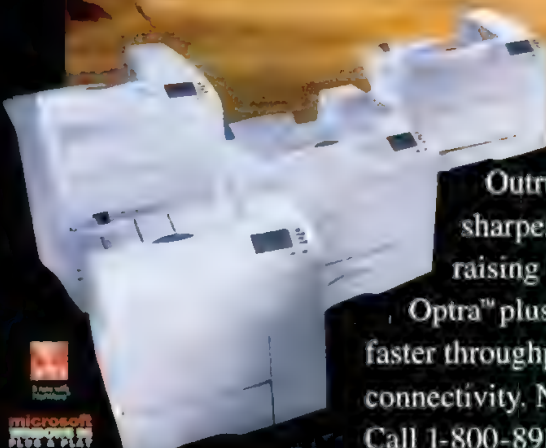
$$\text{Number of bytes copied} + \text{number of bytes taken by directory entries} + \text{hidden file size (if any)}$$

Physical size of compression file (partition)

To test the maximum compression the products were capable of, we enabled the highest compression option and ran one session of repacking. On DriveSpace 3, the files were repacked with the UltraPack option in the Compression Agent, and the Hi-Pack setting was set on subsequent use. On Stacker, we used MaxSpace and ran optimization. In both cases, the available space on the partition was increased, so we ran our filler program repeatedly until the disk showed 0 bytes free.

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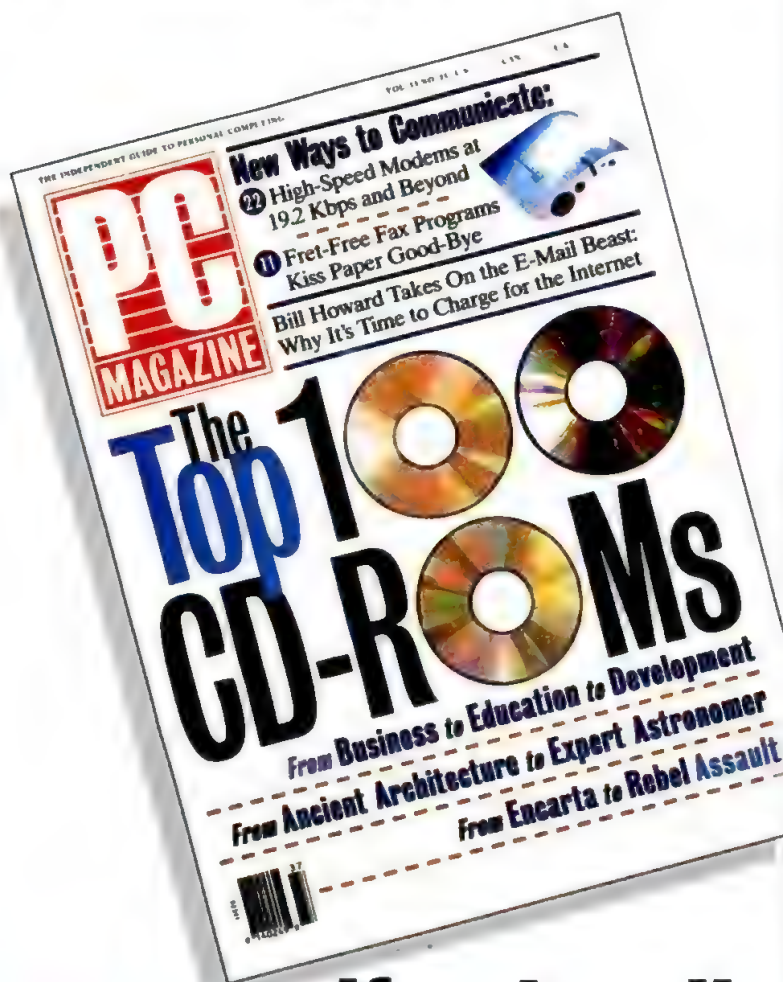
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tion that uses short filenames internally. DriveSpace 3 also showed better compression rates than Stacker on our tests.

READ ALL ABOUT IT

One area in which Stacker outperforms DriveSpace is in its documentation. There is a short mention in the Windows 95 manual and five pages of documentation in the Plus manual, but DriveSpace is documented most extensively within the Help file of the tools applet. Even there,

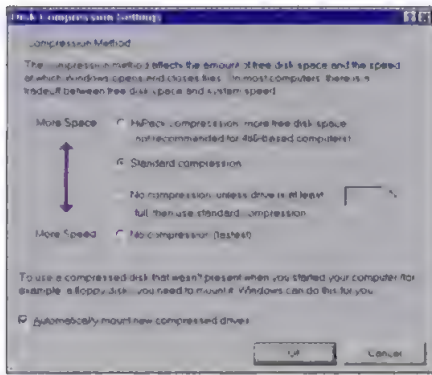
The higher the compression rate on a drive, the more processing required to maintain the rate.

however, the documentation is limited. For example, there is no section on how to handle the problems that occasionally occur on compressed drives.

The higher the compression rate on a drive, the more processing is required to maintain the rate. Depending on your space requirements and the speed of your computer, you may choose a lower compression rate and faster performance—or vice versa, a higher compression rate and slower performance.

DriveSpace 3, like Stacker, offers tunable compression so you can customize it for your needs. There are three levels of compression: Standard, HiPack, and Ultra-Pack. Files are compressed on the fly using Standard or HiPack compression, depending on the option you've chosen. Ultra-Pack, which takes longer to pack and unpack, is useful for infrequently used files. It does not work on the fly, however. Running the DriveSpace 3 Compression Agent, which recompresses your files when the computer is not in use, is the only way to use UltraPack compression.

Versions 2 and 3 of DriveSpace are loaded, unloaded, and tuned from DriveSpace's graphical applet; they don't use DOS-mode tools. We found the creation of compressed drives with both versions to be straightforward and uneventful. We did not experience the out-of-memory problems and other inconveniences that cropped up with Stacker.



DriveSpace 3 lets you tune the compression rate to meet your particular needs for disk space versus system speed.

DriveSpace is not as well documented as Stacker, and that may make some users uncomfortable. But we encountered no problems in our testing. DriveSpace 3 offers superior performance, compression rates, and reliability, and it is a better solution than Stacker for compressing disks under Windows 95.

DriveSpace 2. Price: Free (bundled with Windows 95). Requires: 386-based PC or better, 4MB RAM (8MB recommended), 40MB hard disk space. **DriveSpace 3.** Price: \$49 (included with Microsoft Plus). Requires: 486-based PC or better processor, 8MB RAM, 25MB hard disk space. Microsoft Corp., Redmond, WA; 800-426-9400; fax, 206-635-6100.

Circle 451 on reader service card

Stac Electronics Stacker 4.1

Stacker, Version 4.1, is a Windows 95-compatible version of Stacker, Version 4.0, that still supports DOS and Windows 3.1. Unlike DriveSpace, it's a 16-bit application. A 32-bit version of Stacker has not been announced, and Stac Electronics was noncommittal when we asked about development plans.

Stacker had to be changed in two ways to accommodate Windows 95: It had to handle long filenames, and it had to update how it identified directory names to ensure they are not compressed. (Compressing directory names sharply slows performance.) Long filenames are managed by a standalone utility called SAVELFN, which converts long filenames to short ones and saves

the long filenames in a special file. Stacker, which uses only short filenames internally, makes heavy—though invisible—use of this utility.

STACKING UP

Stacker can't compete with DriveSpace in performance because it's a 16-bit application, and because it needs to do additional processing to handle long filenames. Drives compressed with Stacker took a 15 to 20 percent performance hit, while drives compressed with DriveSpace took a performance hit of only 5 percent or less.

Stacker does claim, however, to out-perform DriveSpace with its compression rate. Its smaller allocation unit (16 bytes versus 512 bytes) and other advanced techniques give Stacker an advantage for which it won our Technical Excellence Award (December 20, 1994). Stacker claims an average compression ratio of 2.5 to 1 or better. Our testing showed lower rates than this, perhaps because of the particular files we were compressing. In comparative rankings, we found that Stacker had a slight edge over DriveSpace 2 in compression rates, and did somewhat worse than DriveSpace 3.

Although Stacker runs reliably under Windows 95, you must be careful when compressing and decompressing Stacked drives. The most vulnerable part of the process is the defrag step, which is run entirely in low memory. If you run out of memory, you get a very scary red box with the message "Fatal Error," and the process aborts. When we restarted the process with more low memory and ran the recovery utilities as instructed in the error messages, Stacker was able to complete the processing, and we lost no data. One warning: Do not accept Stacker's offer to remove TSRs temporarily to increase memory automatically. This does not work

correctly under Windows 95. It will actually *reduce* your available low memory and ensure a crash.

Stacker compresses your drives as part of its installation procedure, and the compression procedure is safest when run from DOS. To install Stacker for the first time, reboot into DOS mode and run Setup from the command line. You should have at least 600K of low memory available before attempting to compress or decompress a disk. (You can change the *buffer=x* line in your CONFIG.SYS to decrease the amount of low memory re-

quired to as little as 256K). If you cannot clear enough low memory by removing TSRs and drivers, you can temporarily include the VGA video space, A000-AFFF, in your memory manager. As long as you are

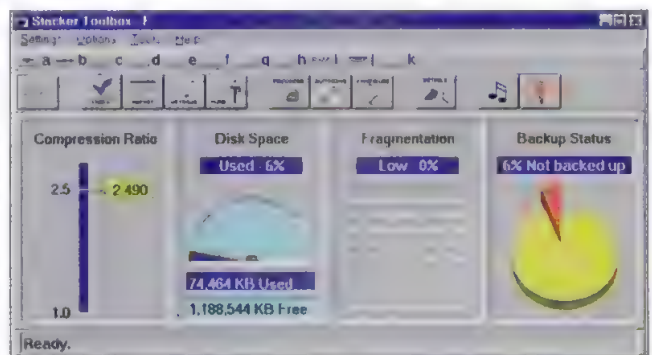
Stacker can't compete with DriveSpace in performance because it's a 16-bit application.

booting to a command prompt, this will give you plenty of low memory without conflicts. After your disk is compressed, you can rerun Setup under Windows to add the Stacker tools to your desktop.

Stacker works reliably under Windows 95 and comes with a richer set of tools than DriveSpace, but it works more slowly, and the initial setup can be nerve-racking.

Stacker, Version 4.1. Estimated street price: \$50. Requires: 3MB hard disk space; 256K to 600K low memory during compression and decompression of drives; DOS 3.2 or later; Microsoft Windows 3.0 or 3.1 or Windows 95. Stac Electronics, San Diego, CA; 800-522-7822, 619-794-4300; fax, 619-794-3717.

Circle 452 on reader service card



Stacker 4.1's Windows Toolbox makes good use of graphics for displaying detailed information about your compressed disks.



Antivirus Software

ALL REVIEWS BY JOEL T. PATZ

Like mosquitoes and hurricanes, computer viruses seem a constant and annoying threat. These ill-directed and sometimes highly destructive incursions into the computer programs we depend on—from spreadsheets to medical monitoring—can wreak havoc with data and productivity.

The sources for viruses grow each day now that so many people are gaining access to the Internet and on-line services (more than 6,700 viruses have been identified to date). Given the quantity of downloadable material, it's not unreasonable to think that some of it will contain viruses. Even if you don't cruise in cyber-

space, a friend may give you a disk with a program "you just have to see." Though your friend means no harm, that disk could contain a virus which would in turn be transmitted to your system.

Even preformatted disks can harbor viruses, and so can unformatted disks. With the introduction of magneto-optical disks and compact disk-recordable drives, it's now possible to extend contamination to other media.

The easiest way to infect your computer is one of the most innocent. Suppose you put a disk in drive A: and leave it there when you turn off your machine. When you next try to boot, you'll see a message warning you that drive A: contains a nonsystem disk. You open the drive's door, press a key, and forget it. If there's a virus on the disk, it has already been transferred to your machine. Now whenever you boot from the hard disk, it's not the Master Boot Record (MBR) setting things up but the memory-resident virus. If the virus is the type that affects the read/write interrupt of your operating system (INT-13), every time you copy a file to a disk, the virus is copied to the disk's boot sector.

While boot-sector viruses are the most frequently found, they aren't the only

ones. Program viruses attack executable files, usually those with .BIN, .COM, .EXE, or .SYS file extensions. Multipartite viruses are capable of infecting both programs and boot sectors, attacking first the MBR and then every program on your computer. Stealth viruses conceal themselves by altering files so they appear not to have been tampered with, and polymorphic viruses mutate so their appearance is never the same twice.

Prior to August 1995, it was believed that viruses hid only in executable files. But a new type of virus was discovered hidden in document files, which affected Microsoft's Word for Windows 6.0. This "prank macro" is a multiplatform virus that can infect documents on Windows 95, Windows NT, Windows 3.x systems, and Macintoshes. The macro virus spreads when you use the File/Save As command.

WINDOWS 95

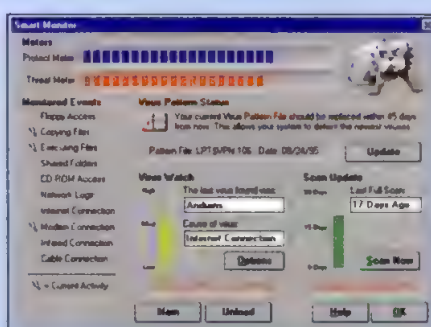
So what about viruses and the new Windows 95 operating system? In part because it maintains compatibility with existing DOS and Windows 3.x programs, Windows 95 remains vulnerable to viruses already on your system. Windows 95 doesn't include a virus scanning program such as the Microsoft AntiVirus program

Virus Detectives to Come

In addition to the products examined here, several other virus solutions are expected from developers in the coming months. Some may be shipping by the time you read this.

TouchStone Software Corp.'s PC-cillin 95 supports everyday tasks, letting you scan disks on demand and rename files. But it will also automatically scan files as they're downloaded from the Internet and on-line services. Even e-mail and attached files will be scanned.

PC-cillin 95 makes use of the company's rules-based technology (also known as VICE: Virus Instructional Code Emulator) to analyze an unknown virus's characteristics and include them in the database. Using code analysis, PC-cillin's clean-up technique will trick the virus into



TouchStone Software's PC-cillin 95's Smart Monitor control panel.

decrypting itself. Dragging an object or folder to the program's icon on the Taskbar will initiate scanning activity. An interesting feature is one-button access to virus updates, which Touchstone will be providing on-line. The product should be shipping by the time

you read this, with an estimated price of \$50.

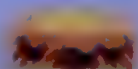
IBM is working on building Windows 95 and Windows NT support into its product IBM AntiVirus. The new version is expected to ship before the end of this year. The current version of IBM AntiVirus runs on OS/2, OS/2 Warp, DOS, and Windows. A network version of the product is available. IBM AntiVirus detects and removes more than 6,000 strains of viruses.

Several Web pages provide an abundance of information on viruses:

- <http://www.fsu.edu/ACNS/Security>
 - <http://delta.com/stiller/stiller.htm>
 - <http://www.brs.ibm.com/ibmav.html>
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copied and delivered and then typed and re-typed

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until my feet hurt and my legs were tired and I was sitting there starting to wonder why the heck running shoes aren't considered standard business attire.

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that shipped with DOS 6.

That's not to say that Windows 95 doesn't offer any protection. If a virus tries to write directly to the hard disk, bypassing the BIOS or DOS, Win 95 will block it and warn the user that application *x* attempted a direct hard-disk write. If the program's name is unfamiliar, chances are it's a virus. Win 95 stops application *x* dead in its tracks before causes damage.

Many viruses work by modifying the Master Boot Record and installing their own INT-13 hook at system boot time. Windows 95 contains a record of the currently known hooks; if you boot another operating system from an infected floppy disk and contaminate the MBR, the next time you boot Windows 95, it will compare the INT-13 hooks of this new system with the previously known record and tell you that something has changed. Since Windows 95 doesn't recognize this new application, a dialog box appears, informing you that the MBR has been modified while Windows 95 was not running and that you may have a virus.

ON THE LIST

Windows 95 also maintains a list of known, proven, "safe" DOS device drivers. If you try to add a new INT-13- or INT-21-based device driver that Windows 95 doesn't recognize, you'll be told that you're now running in DOS compatibility mode. So if a virus doesn't infect the MBR but makes its inroads via a device driver, a message will notify you that something has changed: "A DOS resident program named *xxx* may decrease your system's performance. Would you like to see more information about this problem?" Answering yes takes you to the Performance tab, where you can remove the device driver.

Unfortunately, booting directly from floppy disks is still permitted, and you can still inadvertently boot from an infected floppy disk and corrupt your MBR. Anti-virus programs that worked well on 16-bit systems may not recognize that a 32-bit intrusion has occurred. It's only reasonable to expect that virus writers will find a way around the Windows 95 protection. That's why using a 32-bit virus protection application designed for Windows 95 may be your best bet.

Complacency is not a good stance

when dealing with the possibility of your computer's becoming infected. You'll want a program that provides scheduling capabilities, monitoring functions, frequent updates to its library of known viruses, and an easy-to-use methodology for dealing with a virus once discovered. Without these features, you're likely to expose yourself to unnecessary risk.

We examined several of the antivirus apps available soon after the introduction of Windows 95. Some were already shipping, and others were in various stages of prerelease testing. All do the job: They scan your system, let you know if a virus is present, and offer a variety of solutions ranging from deletion of an infected file to shutting down your computer. The user interface and price of each product are, of course, different; these two factors may be sufficient reason to choose a specific product. The bottom line is that you want to protect your computer. The following utilities will help you do it.

S&S Software International Inc.

Dr. Solomon's Anti-Virus Toolkit (prerelease)

Have you ever wondered what it would be like to have your own personal physician on call 24 hours a day? You may never know, but your computer can. When Dr. Solomon's Anti-Virus Toolkit, from S&S Software International, is running quietly in the background, security, inoculation, and treatment when necessary assure your system's general well-being from day to day. We looked at a prerelease version of the package, which at press time was expected to ship in late October or early November. A company representative said a network version of the package is also planned.

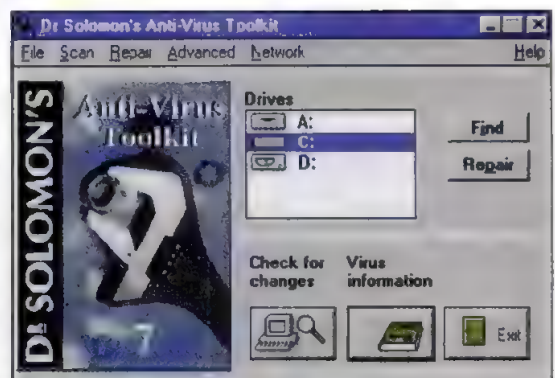
The opening screen of Dr. Solomon's Anti-Virus Toolkit makes it very easy to get your scanning activity underway: Just choose the drive and click Find. When the scan is completed, a report appears showing how many files were checked, how many were not checked, and how many appear to be infected. If a virus is found, you can ask the program to repair it.

While Anti-Virus Toolkit's competition supports many of the same features, its developers have provided an organization and user interface that give this product a very different and agreeable feel. The availability of the on-line Virus Encyclopedia is a major asset, as is the ability to scan six flavors of compressed files. The package will decompress a file and scan its contents on the fly.

HITTING THE BOOKS

The product's Virus Encyclopedia provides detailed information about many of the 6,700 viruses it recognizes. Just perusing it is an eye-opening and instructive exercise. Highlight any of the entries in a browse column and immediately you'll have a full description of the virus: how frequently it's found, how dangerous it is, what it does to your computer, an estimate on repair time, and whether it can be repaired or removed by Anti-Virus Toolkit. If the virus has variants, clicking a button will show how many and their names. A search quickly locates a specific virus.

WinGuard, VirusGuard, and ViVerify, together with FindVirus, are the technological underpinnings of Anti-Virus Toolkit. WinGuard, a 32-bit Virtual Device Driver (VxD), runs in the background when enabled and checks files and disks (the default scan settings are for executable, boot-sector, and partition files, and you can add compressed and data files). This 32-bit application scans all executed or copied files; if a virus is discovered, access to the file is prevented and an alert is given. Anti-Virus Toolkit also intercepts polymorphic viruses. If a disk infected with a boot-sector virus is insert-



Dr. Solomon's Anti-Virus Toolkit's opening screen offers easy accessibility to all the program's functions.

ed into any drive, VirusGuard sounds the alarm and prevents any attempt to copy or run it.

If you choose "Check for changes" on the main screen, ViVerify will detect changes made to files. After making a fingerprint (or checksum) for every file in its file list, Anti-Virus Toolkit compares them all with a file of previously calculated fingerprints. Unlike FindVirus, which scans for specific viruses, ViVerify checks for modifications to files that should not be changed, such as those used in the boot process.

Scanning results can be sent to the log or printer. Additional settings allow you to select the algorithm for establishing your files' fingerprints, in addition to choosing the interval for checking every *n*th byte.

Scheduled scanning activity is set up via a tabbed dialog box. You name the scan event and select which drives and what to check. To complete the process, select how you will be notified if there's a match, and whether or not the files should be repaired if possible. Enabling the Heuristic option means the product will scan for *variants* of known viruses; it will also look for potential infections from what may be unknown viruses. The schedule can be changed at any time. In addition, the same function can be used to schedule any executable program and, if you're on a network, send messages.

Dr. Solomon's Anti-Virus Toolkit (prerelease version). *Estimated list price: Windows 95 version, \$125; OS/2 version (includes DOS and Windows versions), \$145. Requires: 4MB RAM, 5MB hard disk space, Microsoft Windows 95. S&S Software International Inc., Burlington, MA; 617-273-7400; fax, 617-273-7474; Web, <http://www.dr Solomon.com>.*

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Symantec Corp.

Norton AntiVirus for Windows 95

For beginning computer users as well as those who have been around a while, protecting computers against virus contamination with Symantec's Norton AntiVirus for Windows 95 couldn't be easier. If you accept the recommended default options during setup and do a complete installation, Norton

AntiVirus will automatically enable Auto-Protect and Startup scans and schedule an automatic weekly scan of your start-up hard disk.

In case you're not sure whether or not there's a virus on your computer, Norton AntiVirus will scan memory and the start-up drive before installation. If one is detected, the well-documented user guide explains how to get rid of it before installing the antivirus program. Creating a Rescue Disk set is also advised, so you can still start your computer if it's affected by certain boot viruses.

Calling on a database of known computer viruses, Norton AntiVirus's Auto-Protect feature scans program files whenever you use them, monitors for unusual activity that could indicate the presence of a virus, and warns you so you can stop the contamination before it takes place. A scan at start-up will scrutinize the files and boot records that your computer uses each time you boot, much like a guard dog at the front door.

When you're sure your files are free of viruses, Norton AntiVirus's inoculation technology can make sure they stay that way by recalling specific characteristics of a file each time a scan takes place. Potential changes are called to your attention. Compressed files can also be scanned, but if contamination is detected, you'll have to decompress the files to clean them.

By customizing the utility's many features, you can predetermine what is scanned, how notification is given if a virus is detected, what remedial actions are available, and the detail level in the activity log. Specific files or folders can be inoculated or excluded from scans.

Scans can be scheduled or run on demand. If you're using the computer when a scheduled scan starts, the process takes place in the background. A discovered virus triggers the Virus Found alert. Problems found during a manual or scheduled

scan are displayed in a Problems Found dialog box when the scan is complete. In both instances, the type of problem and the name of the virus are displayed, and command buttons for corrective action are

available. If a virus is discovered in memory, Norton AntiVirus stops processing and advises you to shut down your computer.

The Activity Log records detection of known viruses and the implemented solutions. By customizing the Log, you can track other events, such as the detection of unknown viruses, instances of viruslike activity, inoculation

activity, and changes to virus lists. To assure protection against newly discovered viruses, you can download a monthly update of the virus definition files from a variety of on-line sources.

The Norton AntiVirus user guide, in addition to providing excellent advice and clear instruction on how to make the most of all the utility's features, provides troubleshooting tips, a helpful list of system messages, a glossary, and information on using command line switches.

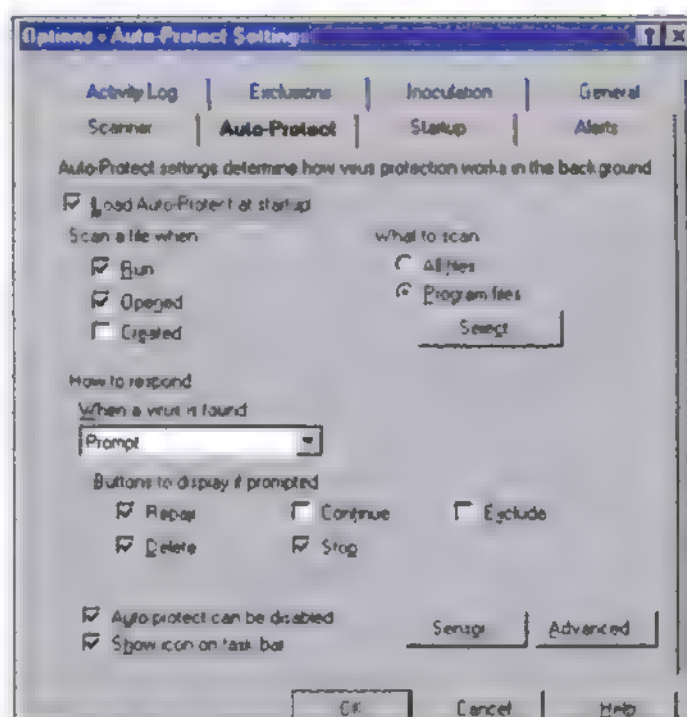
Norton AntiVirus for Windows 95. *Estimated street price: \$79. Requires: 4MB RAM (8MB recommended), 6MB hard disk space, Microsoft Windows 95. Symantec Corp.; Web, <http://www.symantec.com>.*

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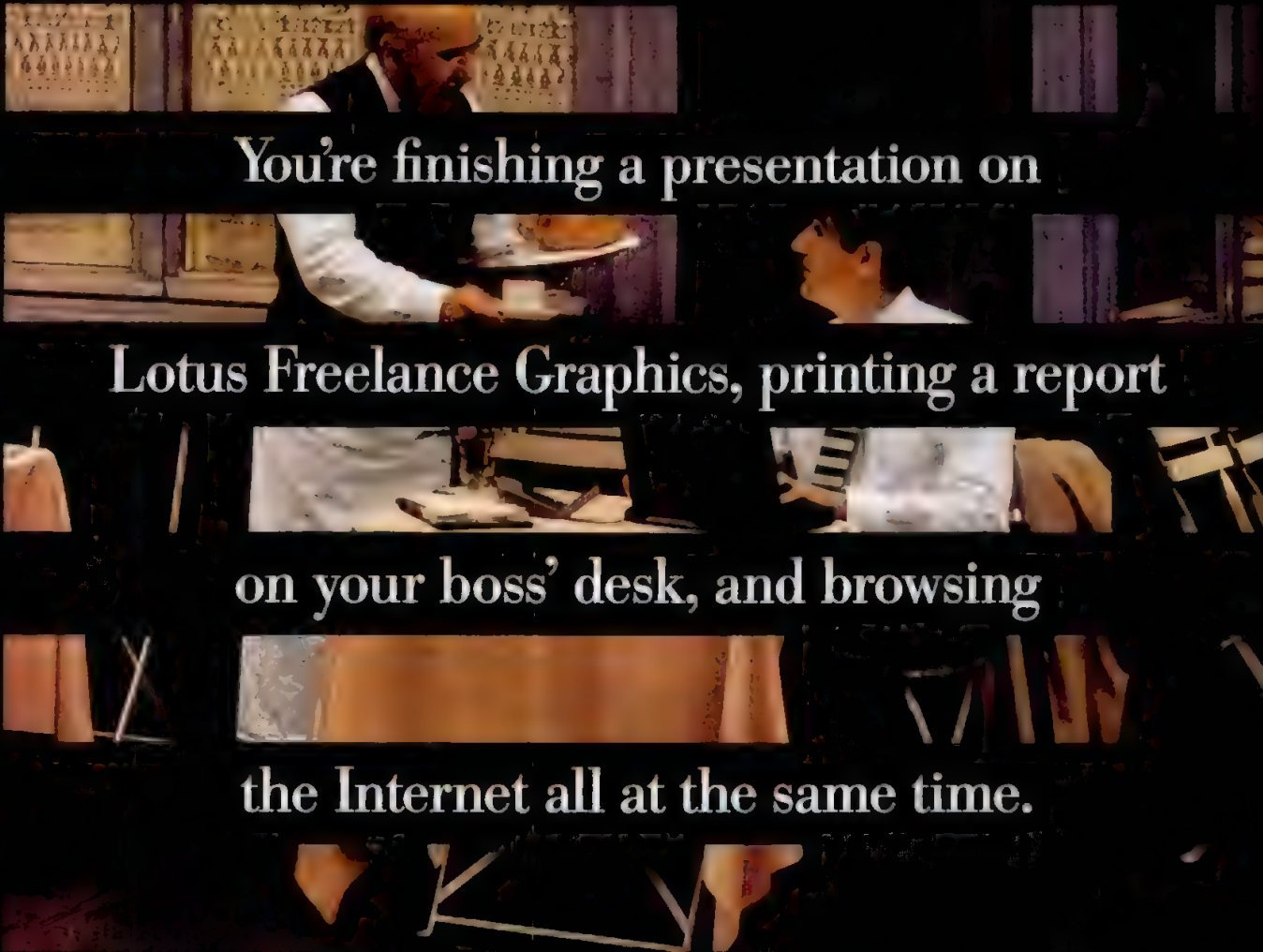
ThunderByte Corp.

ThunderByte Anti-Virus Utilities for Windows 95 (Prerelease)

The protective shield provided by ThunderByte Anti-Virus Utilities for Windows 95 builds a line of defense around your programs and files. Once the relationship between your computer and this utility is established, a watchdog stands guard against any possi-



A dialog box with tabbed pages lets you quickly select settings for Norton AntiVirus for Windows 95 major functions.



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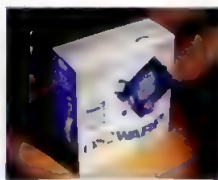
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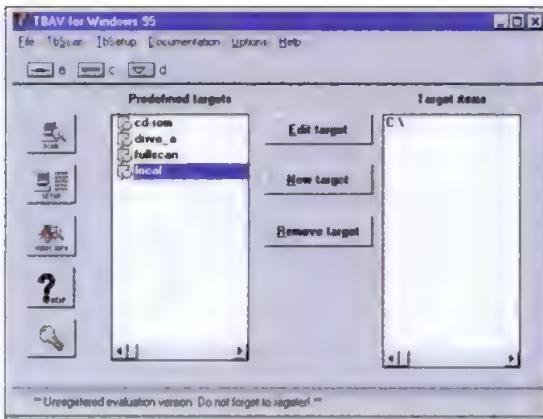
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Windows 95 Utilities



The main screen of the prerelease version of ThunderBYTE Anti-Virus Utilities for Windows 95 shows the predefined targets that the package will scan.

ble intruders. We examined a prerelease version of the product.

are not caused by viruses. From the outset, it's clear that this utility's mission is to *de-*

ThunderByte begins like a shot from a cannon. The setup module, TbSetup, worked through 7,000 files, including 514 executables, in 36 seconds as it generated fingerprint information during the Setup procedure. TbScan, one of the program's workhorse modules, then looked for viruses. Finally, Setup was re-executed to establish a baseline for future integrity verification.

When the setup procedure is complete, ThunderByte has learned all about your computer. This information will be used when confirming that any future changes to programs and files

fect viruses. To remove viruses, rebooting with clean disks in combination with a scanning and cleaning program is recommended in the documentation, Help file, and virus-information database. The developer recommends using a third-party virus-removal utility that is DOS based, not Windows based.

Using heuristic analysis, which searches for suspicious instruction sequences, in addition to signature scanning, ThunderByte monitors any activity that might affect your computer's programs and files. Begin a scan by selecting a target, such as one of the drives established in the setup routine. If you have chosen not to include the subdirectories in a drive, a few mouse clicks will target specific folders or files such as a folder for downloaded files.

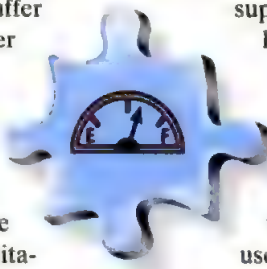
You edit, add, or delete targeted files

Windows 95 Memory and Resource Management

By David Haskin

One reason people are switching to Windows 95 is because they believe that they will no longer suffer from the crashes and other headaches caused by Windows 3.x's poor memory and that resource handling will disappear. Here's the reality: Windows 95 is better, but some memory and resource limitations remain.

In some ways, memory and resource management in Windows 95 is unchanged. Windows 95 continues to support conventional memory,



which is the first 640K of RAM and which is required by programs written for DOS and Windows 3.x. It also still supports upper memory (the RAM between 640K and 1MB) and extended memory (the memory above 1MB).

32-bit applications and drivers, such as those that were written for Windows 95, use more plentiful extended memory, so as you switch over to these newer programs, problems with conventional memory will diminish.

But conventional memory shortages weren't the only problem plaguing Windows 3.x users. Two other areas—Windows-specific memory and Windows resources—also could wreak havoc. Windows 95 largely but not completely alleviates those problems.

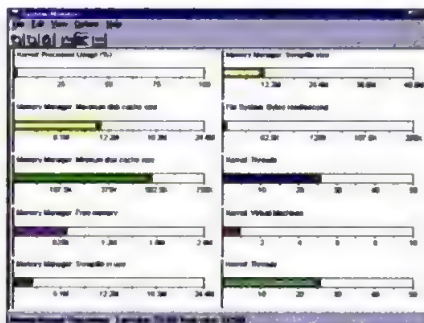
As with Windows 3.x, *resources* in Windows 95 refers to the requirements of two behind-the-scenes modules: GDI and USER. GDI controls display issues such as fonts, icons, bitmaps, pens, and other output such as printing. USER controls objects like buttons, scroll bars, and list boxes. Before an application displays a button, it consults USER, which tracks



SoftRAM 95 comes with a Dashboard-like gauge that tells you how much Windows memory you have and how much SoftRAM 95 created for you.

that object's characteristics such as size and shape. USER then consults GDI, which displays the item and, if necessary, calls appropriate device drivers.

The information managed by USER and GDI is stored in chunks of extended memory called *resource heaps*. Each of the three 16-bit heaps in Windows 3.x could store only 64K of data, so it was all too easy to fill them and then suffer from the resulting crashes and other faults. Windows 95 uses 16-bit heaps only when compatibility and performance are issues. To help reduce the system-resource limitation in Windows 95, many data structures that were formerly stored in



Windows 95's System Monitor provides real-time information about what's going on behind the scenes of your system.

in seconds. As scanning proceeds, a dialog box shows you what is taking place, and a message window displays information on infected or changed files.

Any change in your system's status will trigger one of several messages in the Scan module's dialog box. You will be told if a file is infected by a specific virus, if it has been damaged by a virus, if it is a joke or a *Trojan* (a nondestructive file meant to be amusing or annoying), or if what has been detected is garbage.

Even uninfected programs containing a boot-sector virus to install on your computer are fair game for this utility. The Virus Detected! dialog box gives you the virus's name, heuristic flags (information about the file and warnings about the virus), and choices for possible action.

A Virus Information button opens an-

other dialog box with more specific information about the particular virus and suggestions for how to handle it. Possible action choices include "continue without action," "delete the file," "kill the file" (no chance of recovery), or "rename the file" (for later study). The utility's file-configuration log provides choices ranging from noting only the infected or suspected files to recording details of all warnings.

Optional scanning settings let you configure the program to examine only the files' fingerprint information, examine the boot sector of a disk, and (using repeat scan) easily check multiple disks. You can also determine the level of heuristic sensitivity applied to scanning functions. There are several setup options: You can add only new files to the footprint database, protect changed files from being updated, and

make executable files read only.

Several options found in the Windows version of ThunderByte were missing from the Windows 95 prerelease version that we looked at: Background Scan configuration, File I/O Monitor configuration, Application Execution Tracker, Security Options, and the Automatic Update configuration feature. But according to the company, they will all be included by the release date, which should be available by the time you read this.

ThunderByte Anti-Virus Utilities for Windows 95 (prerelease version). *Estimated street price: \$149. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 95. ThunderByte Corp., Massena, NY; 800-667-8228; fax, 613-936-8429; Web, <http://www.thunderbyte.com>.*

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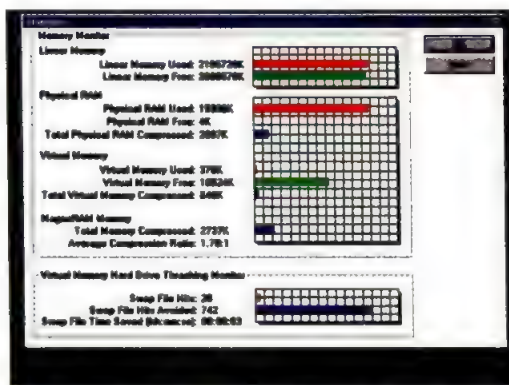
the 16-bit GDI and USER heaps are now stored in 32-bit heaps. This provides more room for the remaining data elements to be created.

A COTTAGE INDUSTRY

These memory and resource problems helped create a cottage industry of DOS and Windows 3.x utilities. Vendors have already migrated some of these utilities to Windows 95, while others will do so soon.

Microsoft even added a couple of its own utilities—System Monitor and Resource Meter—to help you keep track of how your system is using resources and memory. System Monitor shows on-screen, real-time displays for 59 different types of information such as current swap-file size and CPU usage. Resource Meter simply shows the amount of free USER and GDI resources.

While Resource Meter and System Monitor are new, the oldest type of memory and resource management utilities are lower-memory managers like Netroom, QEMM, and 386MAX. The last was to be renamed Qualitas MAX 8 and released in late October. This release will be Windows 95-compatible but not logo compliant.



MagnaRAM 2 provides much useful information, such as the number of swap-disk hits.

More recently, two new species of utilities have emerged: resource managers and RAM doublers. Resource managers such as Helix Software's Hurricane employ a variety of tricks to help extend Windows 3.x resources. The Windows 95 version of this product wasn't available even in prerelease form at press time. The Windows 95 version of Hurricane is expected to ship November 24.

RAM doublers or RAM multipliers such as Connectix's RAM Doubler work with memory much the way disk-compression utilities such as Stacker work with your hard disk. That is, RAM

doublers compress the information Windows stores in RAM so that more data can reside there. These utilities lessen swap-file activity and increase your ability to keep open more and larger applications.

The resource-management-utility vendors have been slow to migrate to Windows 95, though they promise to release new versions late this year. Versions developed for Windows 3.x don't work with Windows 95. RAM Doubler's Windows 95 version is due to ship close to December.

Nor were new versions of the lower-memory managers released at this writing. But we looked at the most recent versions of the most popular low-memory managers—Netroom 3.04, QEMM 7.5, and 386MAX 7.2—to see how well they work with Windows 95. We also looked at the two RAM multipliers available for Windows 95—MagnaRAM 2 and Soft-RAM 95.

INCREASE YOUR MEMORY

RAM multipliers offer hope for those with a small amount of memory, such as 4MB, which Microsoft claims as the

continues

McAfee Associates

VirusScan for Windows 95

Ensuring your computer system's integrity—and being as unintrusive about it as possible—is the name of the game with McAfee Associates' VirusScan for Windows 95. By attaching itself to many of the Windows 95 features, such as Explorer, VirusScan can help your machine stay virus free.

In an effort to provide safe migration to Windows 95, McAfee Associates offers both the Windows 3.1 and the native Windows 95 version of VirusScan in the same box. The package first verifies that your present installation is virus free and that any transferred programs and applications will not infect your new operating system.

VirusScan for Windows 95, which we examine here, offers property pages, long-filename support, virtual device driver technology for memory scanning, context-sensitive help, and browser capability. VirusScan's patented scanning technology, Code Trace and Code Matrix, identifies known and new viruses by calling upon its virus list and applying analytical techniques to ferret out suspicious activity that may indicate the presence of a new intruder.

WHERE TO BEGIN

The easiest way to begin scanning for viruses is by right-clicking on the Start button and selecting the Scan for Viruses option. You can also access the program through Windows Explorer or add an icon to the desktop for frequently

scanned programs or files.

VirusScan's Scan Window is simplicity itself. Three tabbed property pages—Where & What, Actions, and Reports—provide everything you need to configure your scanning activity. On the Where & What page, you can fill in the location of a drive, folder, or file for scanning. You can also scan the subfolders attached to a folder. Compressed files (PKLITE or LZEXE files only) can be included by checking an optional box. If VirusScan detects a virus in the compressed file, you have to decompress the file before eliminating the virus.

On the Actions page, a drop-down list lets you decide how discovery of a virus will be handled: prompt for action, continue to scan, stop the session, clean the infected file, or delete it. Suggestions for

Windows 95 Memory and Resource Management, continued

minimum requirement for Windows 95. We looked at a late beta of MagnaRAM 2 (at press time, the final product was scheduled to ship in late September) and a shipping version of SoftRAM 95 and found that the impact of these products lessens as you add physical memory. For example, neither product helped us load more applications on our 16MB Pentium 90 system.

MagnaRAM 2 was much more satisfying to use, however, speeding up our system for some operations while SoftRAM 95 had no effect. With neither program loaded, it took just under 5 minutes to recalculate a 14.5MB Microsoft Excel worksheet. With SoftRAM 95 loaded, it took an identical amount of time. But using MagnaRAM 2, the recalc took only 2 minutes 50 seconds.

Both programs work by loading a 32-bit device driver from your system Registry. The drivers create buffers within extended memory that store data and, during idle cycles, compress it. This lessens swap-file activity, and MagnaRAM 2 also speeds things up by swapping compressed data to the disk.

MEMORY MANAGEMENT AND YOU

Applications and drivers written specifically for Windows 95 require virtually no conventional memory. As

ROM drive. These drivers, however, work only when you use the Windows 95 graphical interface. If you switch to DOS mode to run, say, a DOS CD-

ROM application or game, you must load the older, real-mode MSCDEX and mouse driver.

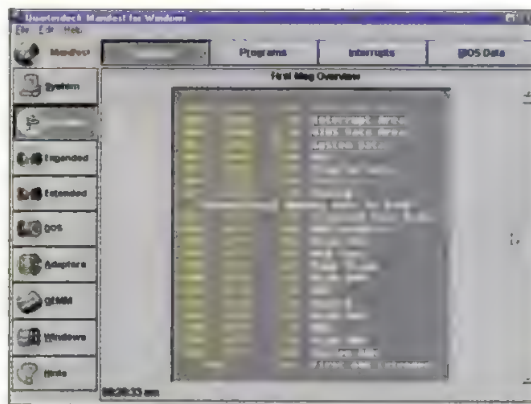
Despite these immediate improvements, many will continue to use legacy applications and drivers in the short term, and those who use a lot of them may still need to manage lower memory. So we checked the most recent versions of Netroom, QEMM, and 386MAX to see whether they still are useful under Windows 95.

Two of the memory managers—Netroom and QEMM—are particularly aggressive, moving items normally stored in upper

memory into either extended or expanded memory. Specifically, QEMM moves the system and the video BIOS into expanded memory, and Netroom moves them into extended memory.

Qualitas, which developed 386MAX, believes that such tricks can cause system instability, and so it takes a more conservative but almost equally effective approach. Rather

continues



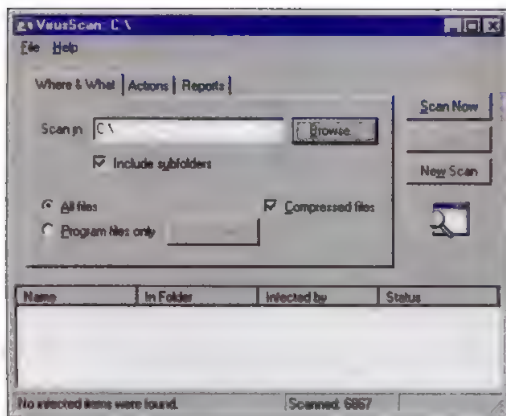
QEMM 7.5's Manifest program for Windows provides thorough reporting of your system's memory usage.

a result, when you switch to these newer pieces of code, you will need to rely less and less on conventional memory. Microsoft is speeding the process along by including scores of 32-bit drivers (also known as *virtual device drivers*, or VxDs) with Windows 95.

The operating system also comes with a series of 32-bit VxDs that replace your mouse driver and MSCDEX, the 16-bit utility needed to run your CD-

*How Do You Tell If
It's A "TRINITRON"?*





McAfee's VirusScan for Windows 95 window lets you set the parameters that define the utility's operation.

discovered virus. If you decide to clean a file and are unsuccessful, VirusScan lets you know. Infected files can also be deleted automatically. The Activity Log maintains a record of scanning activity as well as information on the detected viruses.

On the Reports property page, you determine if an audible alarm will sound upon virus detection and if information on virus activity will be entered in the Log To File record. You can also choose to display a message directing users in how to respond to discovery of a virus.

LOCATION DETERMINATION

appropriate action appear in the Virus Found dialog box. Clicking on the Info button provides information about the

Scanning can be activated from startup or from any of the property pages. If you'd like to scan several locations at a

time, start the process from Explorer, highlight the files or folders you wish to scan, then select Scan for Viruses and finally Scan Now.

McAfee updates its antivirus solutions at least once a month, more frequently if necessary. To ensure that your program contains the most up-to-date virus-recognition files, the upgrades can be downloaded from the McAfee bulletin board (408-988-4004) or from various Internet sites.

VirusScan for Windows 95. List price: \$65; maintenance subscription, \$60 for two years. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.1 or Windows 95. McAfee Associates, Santa Clara, CA; 408-988-3832; fax, 408-970-9727; Web, <http://www.mcafee.com>.

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Windows 95 Memory and Resource Management, continued

than moving code to expanded or extended memory, 386MAX is much more aggressive about exploiting unused addresses in upper memory.

Installing Netroom and QEMM required some minor tweaking. Netroom wouldn't install unless we edited the hidden MSDOS.SYS file so that. Windows 95 booted to the DOS prompt without the sky-and-clouds logo. Also, Netroom refuses to install on some Windows 95 systems, including our test system, unless you download an updated driver (RML0DHI.VXD) from either Helix Software's CompuServe forum or its BBS.

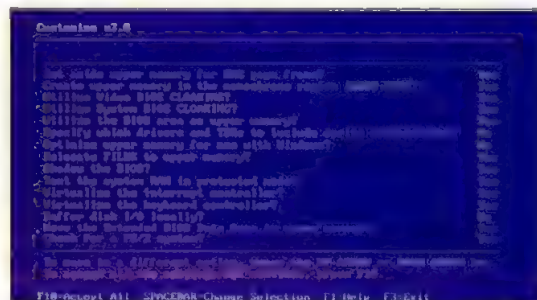
QEMM required the presence of several lines in the CONFIG.SYS file, most of which already existed, such as

LASTDRIVE=Z. But 386MAX did not require any kind of special installation tweaking at all.

After making these minor changes, you use these utilities from the Windows 95 DOS prompt just as you would have with older versions of DOS. The utilities examine your system, figure out the most effective way to shuffle programs and drivers into upper memory, and then change your CONFIG.SYS and AUTOEXEC.BAT files to reflect those changes.

The results enabled us to load at least one program—a DOS screen-capture utility—that we couldn't load before. Our test machine started with 450K of free memory. After using Netroom and QEMM, we had about 595K of free memory. After using the more conservative 386MAX, we had about 585K of free memory.

At this writing, all three vendors were working on versions for Windows 95. The vendors agreed that the Win-



Netroom 3.04 provides an easy-to-use screen for selecting the specific options to include in the optimization process.

dows 95 updates will simplify installation but won't significantly change how the utilities manage conventional memory. But all three vendors said they would be adding resource-management tricks in addition to conventional memory management.

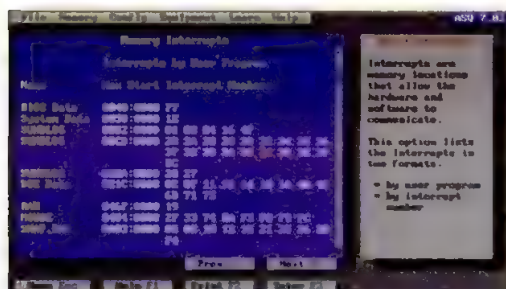
MagnaRAM 2. \$39.95; Quarterdeck Corp.; 310-392-9851; fax, 310-314-4217.

Netroom 3.04. \$99.95; Helix Software Co.; 800-451-0551, 718-392-3100; fax, 718-392-4212.

QEMM 7.5. \$99; Quarterdeck Corp.; 310-392-9851; fax, 310-314-4217.

SoftRAM 95. \$99; Synchronys Software; 310-842-9203; fax, 310-842-9014.

386MAX 7.02. \$99.95; Qualitas Inc.; 301-907-6700; fax, 301-907-0905.



The A3Q reporting program that comes with 386MAX 7.02 is useful, but it isn't as easy to read as similar programs.

BY THE PICTURE ON THE SCREEN.

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Drive Bays (Total)	3	4	5
Ports: Serial/Parallel	1/1 (ECP)	1/1 (ECP)	1/1 (ECP)
Security Features	Yes	Yes	Yes
101-Key Keyboard, Mouse	Yes	Yes	Yes
Software	Windows 95 or MS-Windows® 3.1	Windows 95 or MS-Windows 3.1	Windows 95 or MS-Windows 3.1
Energy Star Compliant	Yes	Yes	Yes
Warranty†	3-Year	3-Year	3-Year
Price*	\$1,699	\$2,749	\$3,329

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Backup Software

ALL REVIEWS BY SHERYL CANTER

Microsoft Windows 95 was designed to be backward-compatible with DOS and Windows 3.1. But backup software, which deals directly with the file system, is a bit of an exception. Windows 95 maintains compatibility with eight-character filenames, so technically you *can* use backup software written for Windows 3.1 or DOS. But there's a problem: When you run a backup process using old software, you're likely to lose the long filenames you already have in use on your system. Your Windows 3.1- or DOS-based software may not work reliably on any partition that contains long filenames, even if you've booted to your old versions of DOS and Windows. You're better off finding software that has been updated to handle the long filenames supported by Windows 95.

The backup utility that came with DOS 6.2 and Windows 3.1 was based on code so old that it was virtually useless on the newest systems. There was no support at all for tape media. When hard disks were 20MB or 30MB, it was standard practice to back up to floppy disks. Today's hard disks are hundreds or even thousands of megabytes, and high-capacity storage media for backup have become essential.

NEW BACKUP TECHNOLOGIES

New controller technology and new tape-format standards have given consumers many affordable, high-capacity alternatives to the old QIC-80, floppy disk-controlled standard. Faster backup speeds are obtained by running off an IDE or SCSI controller rather than the floppy disk controller. These faster drives no

longer require digital tape to match their capacities; SCSI is no longer synonymous with DAT. QIC-Wide and Travan technologies vastly increase the storage capacity of standard magnetic tape. QIC-Wide and Travan tape cartridges look deceptively like QIC-80 tapes, but in fact the tape itself is wider and longer and uses an entirely different storage scheme.

Enhanced IDE has been a big boon to the tape-drive market. IDE controllers are faster than floppy disk drive controllers and less expensive than SCSI. Traditionally used for controlling a single hard disk, the IDE standard has been enhanced to accommodate multiple devices and the specific requirements of nondisk devices such as tape drives and CD-ROM drives.

The new IDE tape drives use an interface called ATAPI to communicate with the controller. Owners of ATAPI tape drives who purchased Windows 95 right after its release will discover that their drives don't work under the new operating system because of a bug in the low-

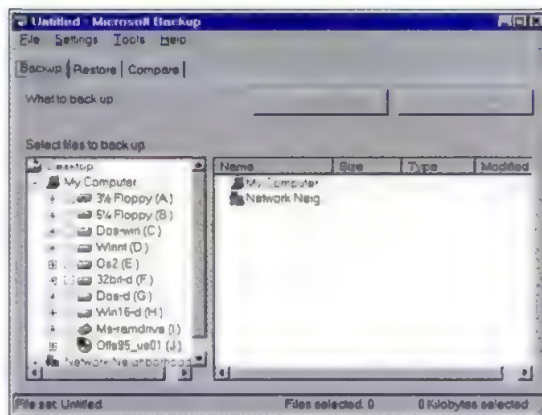
tape formats other than QIC-80 and QIC-3010. QIC-80 tapes can natively (without compression) store 170MB of data; QIC-3010 tapes can store 340MB natively. In today's environment, that's small—and that's old technology. There is no support for DAT, QIC-Wide, or Travan tapes.

In addition, the backup applet ships only with drivers for floppy disk-controlled tape drives. If you're using a QIC-80 tape drive with a SCSI, IDE, or parallel-port controller, it won't work with the applet without a driver from the manufacturer. Although the specification for writing new drivers for the backup applet is available from Microsoft, so far vendors have preferred to write their own applications. The applet is inherently limited to QIC-80 and QIC-3010 tape formats—no driver can get around this limitation—and it lacks a scheduler for running unattended backups during off-hours.

THE BACKUP SOFTWARE MARKET

Most standalone backup software is sold to manufacturers or distributors for bundling with tape drives, rather than to end users. But the software can be purchased by end users, and there are differences among the competing products.

The backup software that is bundled with most of the tape drives on the market today comes from three vendors: Arcada, CMS, and NovaStor. Cheyenne, which specializes in enterprise backup solutions for NetWare, is also about to release a desktop product for Windows 95. The Cheyenne product, called ArcSolo, will begin ship-



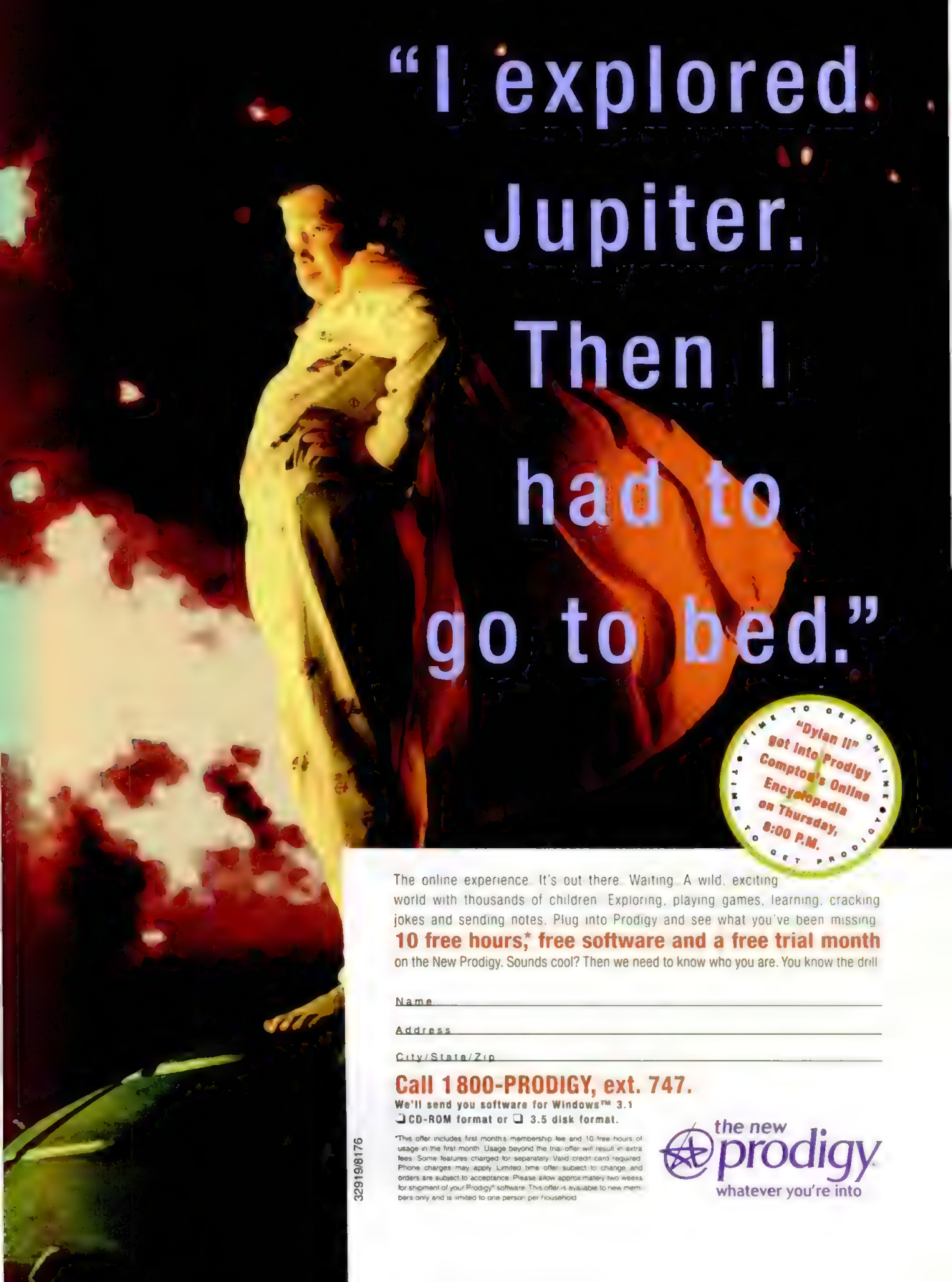
The backup applet included with Windows 95 offers a friendly interface, but device support is slim.

level ATAPI driver. This problem was fixed just before press time, so later purchasers of Windows 95 won't encounter the problem. Early purchasers of Windows 95 should contact Microsoft for a replacement driver.

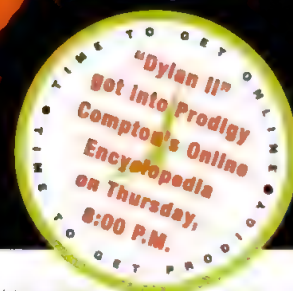
THE WINDOWS 95 BACKUP APPLLET

The backup applet that comes with Windows 95 is a complete rewrite, provided for Microsoft by Colorado Memory Systems (CMS), and it does support tape drives now. But the rush to get Windows 95 to market kept CMS from adding support for

ping in early November; Cheyenne was unable to provide a prerelease copy in time for us to review. Only CMS's Colorado Backup for Windows 95 and NovaStor's NovaBack were shipping at the time of this writing, but we were able to test a prerelease version of Arcada Backup for Windows 95. Symantec's Norton Backup didn't even make it that far: At press time, plans for developing a Windows 95 version of the desktop edition were vague. Symantec's plans for the Windows 95 version of the enterprise edition, on the other hand, were already underway.



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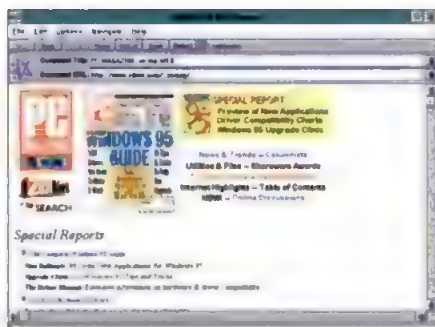
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Arcada Software Inc.

Arcada Backup for Windows 95 (prerelease)

Arcada Software, whose bundling partners include Conner Peripherals, has a Windows 95 version of its backup software scheduled for release by the time you read this: a true 32-bit application that takes advantage of Windows 95 features, like Plug and Play and tabbed pages, and supports virtually every tape drive on the market.

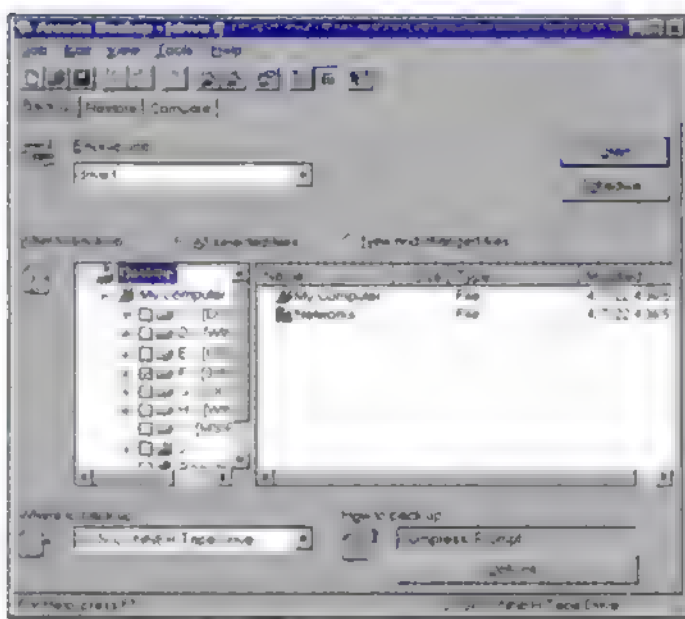
Those familiar with Arcada software for DOS or Windows 3.1 will see some sharp differences in the Windows 95 product; the feature set has been scaled back considerably. For example, the Windows 3.1 product has both Quick Erase and Security Erase features. The Windows 95 product has only the former. Arcada says it will add features if users demand them, but in general it's opting for ease of use over feature glut, believing this approach best meets the needs of most customers.

The Arcada interface has undergone significant changes. Tabbed pages let you select dialogs for Backup, Restore, or Compare. The What, Where, and How buttons in the Windows 3.1 interface have been replaced by controls with similar labels all on the same page. If you find the layout confusing, you can use the Backup and Restore Wizards to guide you through the settings.

LET'S GO TO TAPE

Setting up your tape drive for use with the software has become easier under Windows 95 because of Arcada's Plug and Play support. Configuration is automatic, and in fact there's no Configuration option in the software as there was in the Windows 3.1 version.

The Windows 95 Registry is of central importance in the operating system. If your Registry is corrupted or out of date, the operating system just won't boot. This is a potential problem from a backup standpoint. What if you add new hardware between the time you back up your Registry and the time you restore it? Arcada solves this problem by treating the Registry as a separate volume and restoring it in a special way. Rather than overwriting a partially corrupted Registry, Arcada will compare the backup version with the ver-



Arcada Backup for Windows 95 offers an updated interface, replacing the old Backup, Restore, and Compare buttons with tabbed pages.

sion on-disk and add any missing keys.

One planned feature that won't make it into the first release is disaster recovery. If you have a complete hard disk crash that wipes out Windows 95, you must reinstall it and then reinstall the backup software to restore your drive. Future versions will let you create disaster-recovery floppy disks that eliminate these time-consuming steps.

Arcada Backup for Windows 95 goes beyond long-filename recognition to provide a 32-bit application with Plug and Play support and an updated interface. Its scaled-back feature set is designed for ease of use rather than maximum power and configurability.

Arcada Backup for Windows 95 (prerelease version). List price: \$99. Requires: 8MB RAM, 5MB hard disk space, compatible tape drive. Microsoft Windows 95. Arcada Software Inc., Lake Mary, FL; 800-327-2232, 407-333-7500; fax, 407-333-7730; Web, <http://www.arcada.com>.

Circle 457 on reader service card

Colorado Memory Systems

Colorado Backup for Windows 95

Colorado Memory Systems (CMS), now a division of Hewlett-Packard, wrote the backup applet that comes with Windows 95. The applet supports most floppy disk-controlled QIC-80 and QIC-3010 drives, but time constraints prevented CMS from including support for DAT, QIC-Wide, and Travan drives.

With additional drivers, the applet can

be made to work with SCSI, IDE, and parallel-port tape drives, but only if the drive uses QIC-80 or QIC-3010 tapes—an inherent limitation of the applet. The applet also lacks a scheduler for running backup jobs during off-hours.

Colorado Backup for Windows 95 uses the same user interface as the Windows applet, but internal modifications let the program work with other tape formats. New drivers also enable the application to work with additional types of controllers. But support is limited to tape drives made by HP and CMS, and if you don't have one, this software will not be of use to you. A standalone scheduler lets you perform unattended backups during off-hours.

Colorado Backup for Windows 95, which zips to a little over 600K, can be downloaded for free from the CMS bulletin board or obtained by mail for the cost of postage and handling. If you want a printed manual, the cost is \$24.95. The package includes the most recent versions of Colorado Backup for DOS and Colorado Backup for Windows 3.x.

The installation of Colorado Backup is highly automated. You don't even have an opportunity to select the drive and directory where the program is stored. The company says this limitation was imposed by the Windows 95 hardware-installation routine, which doesn't provide a way to prompt for a target drive and directory. The software is stored in a subdirectory called BACKUP under your Windows directory. The standalone scheduler utility is automatically loaded with a typical backup schedule, and the Scheduler is placed in your Startup folder.

Colorado Backup for Windows 95 is a straightforward, easy-to-use backup utility for owners of CMS or HP tape drives. Those with drives from other manufacturers will need to look elsewhere.

Colorado Backup for Windows 95. List price: To download, free; disks, \$7.95 (for shipping and handling); disks and manuals, \$24.95. Requires: 1MB RAM, 2MB hard disk space, HP or CMS tape drive, Microsoft Windows 95. Colorado Memory Systems, a division of Hewlett-Packard Co., Loveland, CO; 800-469-5150; fax, 970-667-0997; BBS, 970-635-0650 (up to 14.4 Kbps).

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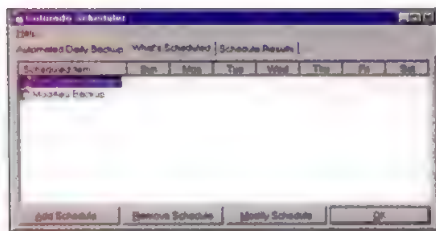
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Colorado Backup for Windows 95 comes with a standalone Scheduler preconfigured with a typical backup schedule.

NovaStor Corp.

NovaBack for Windows 95 and Windows NT

NovaStor's NovaBack (estimated street price \$149), released simultaneously with Windows 95, was the first third-party Windows 95 backup product on the market. But the price of winning the race to market was a few missing features. The initial release that we reviewed supports only SCSI tape drives, is missing the NovaBoot disaster recovery utility, and lacks software compression.

The maintenance upgrade, Version 4.01, which should be available by the time you read this, adds software compression and support for floppy disk and IDE-controlled tape drives. It will contain NovaBoot and a utility, Dragon Drop, to access files directly from tape.

NovaBack is designed as a suite of utilities that can be accessed separately or from within the main app. The Scheduler lets you run unattended backup jobs off-hours. At the time of this writing, the Scheduler worked only when used within NovaBack; launched as a separate application, it didn't work. NovaStor is working on the problem.

NovaBack doesn't have Plug and Play support. A Tape Setup utility tries to identify the drive you're using and fills in necessary information from a specifications table. Tape drives missing from the table can be configured manually, but you will probably need to call NovaStor for help.

NovaBack's user interface is somewhat clumsy and inconsistent. One example is the Custom Backup option, which lets you select files for a partial backup. You see two side-by-side list boxes. The left one contains a directory tree; the right one shows filenames. To expand the directory tree, left-click on the folder icon.

To select a branch for backup, left-click on the directory name. To move the cursor up or down the tree, left-click on a blank part of the line. This nonstandard method can be confusing. To make matters worse, this selection method is not used consistently throughout the program: To select a tape volume from within the Restore feature, right-click on the entry in the list box.

One nice feature is an automatically updated database that can tell you what files you backed up to what tape and when. A search facility lets you find all instances of a specific file. When you decide to reuse a tape, you delete the tape from the database. (The Delete button wasn't working properly in the version we reviewed; this problem will be addressed in Version 4.01, according to the company.)

NovaBack doesn't take advantage of Plug and Play or the new Windows 95 interface widgets, and its interface is somewhat ungainly. Version 4.0 lacks crucial features such as support for floppy disk and IDE tape drives and software compression, but the maintenance release, which should address some of these issues, ought to be available by the time you read this. □



The main screen of NovaBack for Windows 95 and Windows NT consists of five oversize buttons: Standard Backup, Custom Backup, Run/Edit Backup Procedure, Restore, and Exit.

NovaBack for Windows 95 and Windows NT, Version 4.0. Estimated street price: \$149. Requires: 4MB RAM, 6MB hard disk space, Microsoft Windows 95 or Windows NT 3.5 or later. NovaStor Corp., Simi Valley, CA; 805-579-6700; fax, 805-579-6710.

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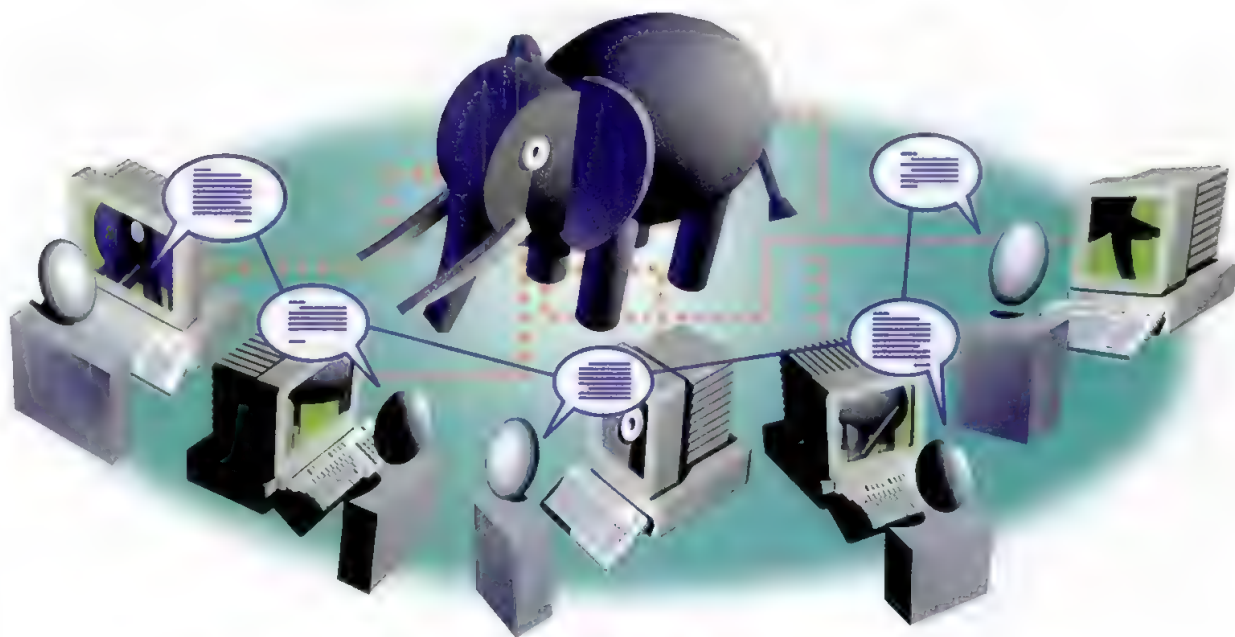
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Let's Talk

E-mail is great, but being able to search, sort, and store your workgroup's conversations is even better. These six group discussion programs help you do it.

hese days, electronic mail is a vital part of our daily work lives, and it's great—as far as it goes. But have you ever tried to conduct an ongoing discussion with a large group of people via e-mail? Conversing over e-mail works best when two or three people talk among themselves in a question/answer or point/counterpoint way. Try to engage a large group in a lively debate or exchange of ideas, and it becomes a mess. It's hard to enter into a discussion that's already been underway for a while, and conversations can become almost impossible to follow.

Group discussion software transforms your and your coworkers' on-line conversations into incredibly useful databases that you can search, sort, and archive. It's a tool that can, as its advocates colorfully point out, "capture corporate memory."

By Tony Pompili

HIGHLIGHTS

Group Discussion Software

With more of us doing our talking on-line, the growing importance of discussion software comes as no surprise. Not only are these packages being used to manage internal discussions, but they are expanding to include remote communication and, of course, Internet-based communication.

BETTER HOOKS between e-mail and discussion software have been keeping discussion software developers busy. Though discussion software isn't necessarily a replacement for e-mail, it can certainly enhance e-mail's effectiveness. The key is for discussion software to take advantage of this mail-centered way of communicating.

API STANDARDS (VIM, MAPI, and MAPI 1.0) maximize the marriage of discussion software and e-mail. Discussion software vendors are working to make their packages support the

major standards, ensuring that discussion software will be able to handle anything your e-mail package can.

ATTACHMENTS are another crucial element of the discussion world. As more people communicate electronically, what would once have been part of a slide presentation, such as a chart or spreadsheet, now needs to be transmitted on-line. Discussion software is beginning to accommodate the variety of formats in which attachments come.

AN INTELLIGENT INTERFACE is yet another demand users are making of discussion software. Cleaner design allows those participating in the discussion to discern which messages are new, which are old, and which are responses. More and more packages are achieving this goal with a three-paned interface.

1.1c Professional Edition, Lotus Notes 3, Attachmate Corp.'s OpenMind, Trax Software's TeamTalk 2.0, and TeamWare's TeamWare 3.0. Not available at the time of evaluation was the much-anticipated Lotus Notes Release 4, expected out by the end of the year (we take a sneak peek in "What's Next for Notes?").

The products we've reviewed have differing appeals. OpenMind, Collabra Share, TeamTalk, and Conference+ all try to enhance your existing e-mail's ability to handle group discussions (in fact, Conference+ only works with Microsoft Mail). Discussion is just one part of Lotus Notes' and TeamWare's more comprehensive feature sets.

Lotus Notes deserves special mention

for its broader, application-development approach. Beyond discussions, Notes provides a customizable, programmable environment for creating a wide variety of workgroup applications and access to a variety of third-party databases through its DataLens and ODBC drivers.

In sidebars, we take a look at several other upcoming or particularly interesting group discussion solutions: First Class, GroupWorks, Personal Discussions, and QuestMap.

MANAGING NEW METAPHORS

Developers of discussion software realize that while PC users are accustomed to using e-mail, they may find holding conversations in a discussion package to be difficult for a number of reasons, and not just because the concept of outlined, threaded discussions may be slightly difficult to grasp.

No one likes to use two applications when it seems like one should do the trick, so it's vital that the e-mail systems people currently use integrate smoothly into a group discussion package. To use tools like these effectively, you need to check them frequently, and you should respond to messages with some regularity. But there's only so much time in the day. If you've grown used to checking one in-box, you want to keep on checking just one.

Discussion software also needs to support the popular messaging standards to send, receive, and launch e-mail. They include the Vendor Independent Messaging interface (VIM) and the Messaging API (MAPI).

The products we've evaluated take varying approaches. Conference+ piggybacks on top of Microsoft Mail, for example; Lotus Notes has its own e-mail program, so discussions and mail appear in the same client software. TeamWare, while relatively closed in its architecture, offers far more than just its Forum discus-

On-line group discussions are "threaded"—that is, presented in some kind of outline-like format that lets you see the context of messages up front, helping you to respond to specific points at any time. (There's no need to quote the original message in your response because everyone knows what you're referring to.)

The alternative—and it's an ugly one—is an endless series of incoming e-mail messages that have no order, organization, or structure. If you've used Internet newsgroups or discussion forums on on-line services like CompuServe or America Online, you have some idea of what a threaded discussion looks like.

Because group discussion packages are built around databases, they can also be used to manage all kinds of incoming information, whether it's a news feed that you can sort by date, topic, or source; a corporate suggestion box; or even classified ads from your coworkers, neatly arranged by category.

In this story, we evaluate six products that manage group discussions. The lineup includes Collabra Software's Collabra Share 2.0, The Mesa Group's Conference+

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sion application. It has document management and electronic mail for those companies still in the position of purchasing an all-in-one workgroup solution.

OUT OF SIGHT, STILL IN MIND

Of course, just because you're in a workgroup doesn't mean you're in the office. Wide area LAN-based discussion users and dial-up users in an organization may be spread out around the world, and all of them need access to up-to-date discussions. At the same time, system administrators need to be able to set up and maintain the discussions throughout this system.

There are two ways to keep users connected to discussions: either by providing dial-in remote access to the server, or by letting users work off-line and then "replicate" their work back to the discussion databases later.

Most of the products we evaluated still need to improve their remote connectivity. Lotus Notes is one of only two packages that lets you actually work off-line and replicate later with servers. (Conference+ offers this feature, too, but it's poorly documented.) Collabra Share still relies on remote node, real-time access using products such as Shiva LanRover.

TeamWare uses a proprietary relay application running on a PC. More difficult to install than the other remote solutions, it does provide direct access to any TeamWare server on the network, unlike Notes, which only gives you access to a single server.

THREE-PANE INTERFACE

If there's one thing most of these packages do have in common, it's their interface strategies. The trend is toward a three-pane approach that lets you see folders, message subjects, and previews of messages all at the same time. TeamTalk stands out with its "verbose" view of a thread that lets you read the thread as if it were a continuous message. Similarly, Collabra Share's Thread Summary lets you create a single message with the contents of the entire thread.

Our Contributors: TONY POMPILI is a contributing editor and BEN Z. GOTTESMAN is a technical director at *PC Magazine*. DON WILLMOTT was the executive editor in charge of this story.

Collabra Share 2.0

In Version 2.0, Collabra Share continues to outpace its competitors in the group discussion software market, with tight links to e-mail and a great interface. The program's universal mail integration and its new client/

server architecture are unsurpassed by any of the other programs in this evaluation.

If you need to access your e-mail from within your group discussion program, Collabra Share provides the best bidirectional hooks for accomplishing that. You can get to your e-mail from Collabra Share, and to Collabra Share from your e-mail, which is extremely handy. Collabra Share's only drawback: the program has no facilities for replication.

Of the six packages we evaluated, Collabra Share has the most flexible forums. A new Moderated Forum access control designates a supervisor, or moderator, who reads any new messages before they become public. Collabra Share also has powerful and comprehensive search capabilities. Note that the purchase of Collabra by Netscape means that many World-Wide Web discussions will soon have a Collabra look.

Some of the other packages we

evaluated are worth setting aside the time to take a look. OpenMind is very innovative, Notes is unquestionably powerful and customizable, and TeamTalk suits small workgroups well. Taking integration to its fullest is Conference+. This package runs only in conjunction with Microsoft Mail, working directly with Microsoft's Global Address List. If your organization is committed to Microsoft Mail and integration is what you're after, you should consider the advantages that Conference+ has to offer.

Similarly, TeamWare has tight integration with e-mail, but only with its own proprietary TeamWare Office Mail package, which is, of course, extremely limiting. Though slightly broader in its approach, Lotus Notes today still supports only VIM-based mail such as Lotus's own popular cc:Mail. Nevertheless, Notes' power extends far beyond simple group discussion and is a great corporate groupware solution.

ence+, on the other hand, offer only limited searching.

Collabra Share, TeamTalk, and Notes offer message types under Windows 3.x that can hold everything but the kitchen sink. Notes, OpenMind, and TeamWare all have Macintosh clients, but TeamWare's Mac client doesn't support Forum, its discussion software. That's not much help.

INTERESTING INFRASTRUCTURE

On the enterprise side, Collabra Share has joined OpenMind, Notes, and TeamWare in offering client/server architecture. That helps it support large and widespread organizations more easily. Collabra Share is also unique in offering a file-sharing version for smaller organizations (as well as its client/server version).

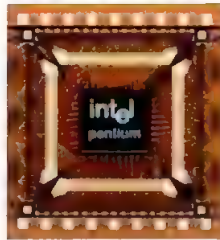


Navigation tools are also becoming more prominent. For example, Notes, Collabra Share, and Conference+ all now include some sort of internal hypertext that lets you double-click on embedded icons to jump to messages within and among discussions.

SEARCH TOOLS

The ability to search is imperative, especially in long discussions. Collabra Share, OpenMind, and Notes all offer full-text search engines that produce well-organized result lists. TeamTalk goes a step further and actually lets you search across discussions. TeamWare and Confer-

GET PENTIUM.



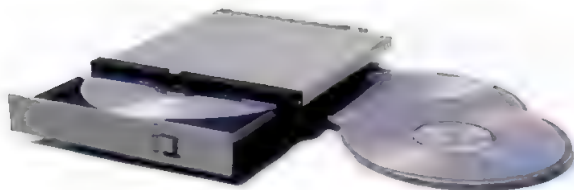
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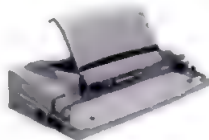


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GROUP DISCUSSION

Suitability to Task

The **administration** task looks at what is involved in setting up the application both on one or more servers and the client. We also examine the process of setting up new discussions, granting rights to users and other administrative tools.

The **conferencing** task focuses on the client. We look at how easily a user can peruse one or more discussions, search for messages, and add new messages to a discussion.

The **remote access** task looks at the tools available for a user who is not directly connected to the LAN. We consider both users who can access the network via remote access software, and users who want to replicate discussions to their own computer and work disconnected.

SUITABILITY TO TASK		
Product name	Power	Ease
Administration	Poor	Poor
Conferencing	Fair	Fair
Remote access	Good	Good
Outside mail integration	Good	Good
Extensibility	Good	Good

Suitability to task scores reflect how well a product fares for a particular type of application. From best to worst, possible ratings are *excellent*, *good*, *fair* and *poor*.

Power represents the breadth and depth of features available for a given task.

Ease represents the ease of learning and ease of use of the features that are present for a given task.

The **extensibility** task looks at both the user's and administrator's ability to modify the client interface, as well as integrate the software with other applications, including Lotus Notes and the Internet.

The **outside mail integration** task looks at how well the program allows users who do not have the discussion software client to participate. We look for the ability to be notified of and join new discussions, submit and receive messages, and search for messages.

Notes and TeamWare don't duplicate your e-mail system because they are your e-mail system. Collabra Share, Conference+, and TeamTalk leverage your existing e-mail system for distributing data throughout the organization. In OpenMind, e-mail isn't part of the equation for distributing discussions across servers.

Notes still excels with its proprietary direct replication and tight security. Its cross-platform support for NT, OS/2, NetWare, and Unix is matched only by TeamWare.

LETTING THE OUTSIDE WORLD IN

Often, people outside your workgroup will need access to your discussions. How can they participate if they don't use the software? Collabra Share, Conference+, OpenMind, and TeamTalk have gateways that let users of e-mail join, participate in, and search discussions. With Notes, external users can submit messages to discussions, but they won't appear in context.

You can also use some of these packages as windows into the Internet. Collabra Share, Conference+, and Notes all connect to Internet newsgroups, and users of OpenMind can even link Web

pages directly to their discussion messages. It's also important to note that users of Collabra Share and Conference+ can connect to Notes discussions and participate in them. As the world beyond your workgroup becomes increasingly interconnected, it's important that you find ways to include it in your discussions.

Collabra Software Inc.

Collabra Share



Collabra Software has enhanced its already powerful Collabra Share with a new version, 2.0, that offers interface enhancements, tighter integration with MAPI and VIM e-mail, and a client/server version for greater infrastructure flexibility and improved performance. It's also soon to show up in Netscape's Web browser.

Collabra Share is the most comprehensive discussion package of those evaluated here. It's also the easiest to install, whether on your file server, on NT application server, or for new clients (which it installs automatically). To ease moving between e-mail and Collabra Share, the

new version lets you launch Collabra Share from the File menu of mail packages such as Microsoft Mail or the Microsoft Exchange client in Windows 95. Or you can simply click on the Quick-Launch icon in the toolbar. Conversely, when Collabra Share launches, you have the option of launching mail, too.

Features such as the InfoNavigator icon and hypertext links speed up moving around forums. On the infrastructure side, optional gateways to Lotus Notes

▶ FACT FILE

Collabra Share 2.0

List price: Server, \$395; Workgroup Edition, \$69.95 (Client/Server Edition, \$39.95 per user for the first 100 users). **Architectures:** Client/server and file sharing. **Requires:** Server: 486/66-based PC or better, 32MB RAM, Microsoft Windows NT. Client: 386-based PC or better, 4MB RAM, Windows 3.x. **In short:** Collabra Share's latest version now has client/server architecture and tighter integration with electronic mail. Better navigation and message formatting features make moving about forums and creating messages a lot quicker. The product installs directly on third-party mail file menus, and though it still supports file sharing servers, the client/server version ultimately improves remote access response.

Collabra Software Inc., 1091 N. Shoreline Blvd., Mountain View, CA 94043; 800-474-7427, 415-940-6400; fax, 415-940-6440; e-mail, info@collabra.com.
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Group Discussion

discussion databases and to Internet newsgroups let you send and receive electronic mail and database documents among all three systems.

MEETING MAIL USERS' NEEDS

Collabra Share goes a long way toward meeting the needs of mail users who are already wed to their existing mail packages but want to add discussion functionality.

For example, when we created a new forum in Collabra Share, we had the choice of sending all of its members a message with an imbedded icon object to allow them to launch the program and open up the forum. And it's intelligent, too: If Collabra Share wasn't yet installed, a setup program automatically intervened to help us get our users up and running. For more versatile integration between applications, Collabra Share supports OLE 2.0 under all versions of Windows.

Creating forums and messages is easy. Messages appear in views as indented threads, with simple icons to indicate thread levels and read status. An interesting new feature called the Thread Summary compiles a thread, including subject line and the actual text of the compiled messages, into a single message complete with hypertext links to actual documents. From the Summary we could peruse the entire thread from a single document.

We were also able to use Collabra Share 2.0's new bulleted list-formatting and paragraph-indentation tools to quickly improve the appearance of messages. These tools add to the already rich palette of text formatting features.

FLEXIBLE FORUMS

Collabra Share has some of the most flexible forum attributes of all of the packages reviewed here. For example, a new Moderated Forum access control designates a supervisor, or moderator, to first read any new messages before they become public. You can choose to moderate all messages or just those submitted anonymously.

This is especially useful for high-profile discussions.

Collabra Share offers e-mail users the broadest range of options for interacting with forums of all the products reviewed here. As members of a forum, e-mail users can not only receive messages, but they can also create replies that return to the correct thread position. They can also use e-mail in a batch-like mode to issue Collabra Share commands.

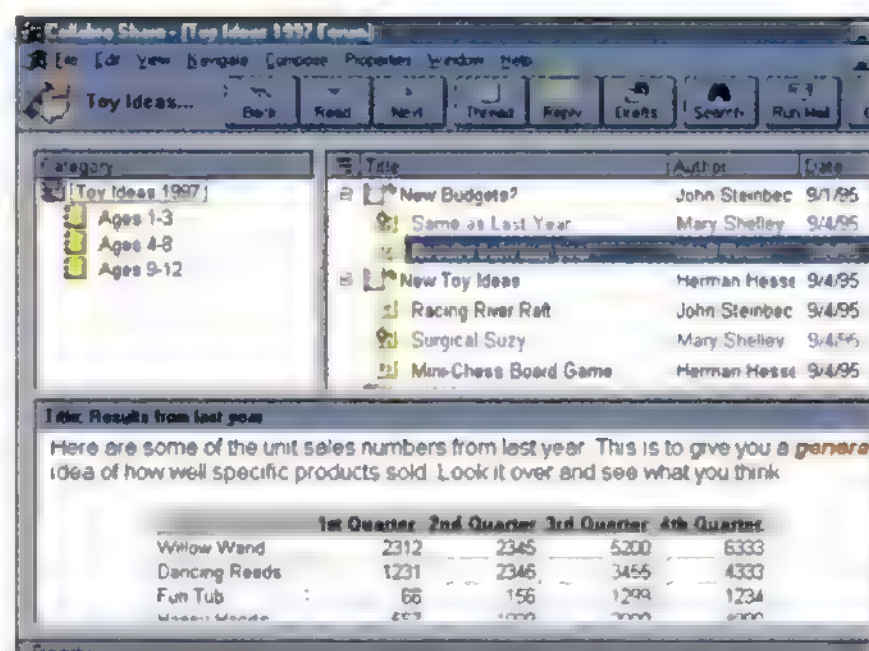
The new version of Collabra Share also gives each user personal organization tools for customizing discussion information. For example, you can create groups of forums that let you organize them in a folderlike system. You can also create a personal hot list of messages.

POWERFUL SEARCH ENGINE

Collabra Share's search engine, which is similar to the one in Notes, lets you search for anything from a word in the subject field to words in the body of message. As in TeamTalk, the compiled list of messages can be viewed individually within the search result list or opened in the context of the actual forum the message belongs in. Search uses a simple interface to build actual Boolean search statements.

The client/server architecture, based on an NT server, is new to version 2.0. While Collabra Share still runs on the file sharing architecture, the new server, similar to a Notes or TeamWare server, gives users access to a wider variety of servers, improved performance, and faster remote connectivity. Collabra Share still exploits existing e-mail networks to maintain replicas of forums among different sites. This network is also used to maintain a unified Share Registry, letting you have a single list of users and rights.

Version 2.0 also has a built-in remote access system. You have to be connected to the network using a product such as a Shiva LanRover or Microsoft RAS. You



Collabra Share features flags and icons to highlight unread messages and lets you embed OLE 2.0 objects.

can't work off-line (as you would with a product such as Notes), so mobile users are a little more restricted in what they can do. However, the new client/server architecture minimizes the network traffic, making dial-up remote access still pretty impressive.

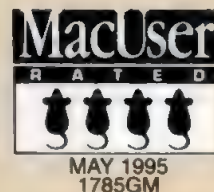
Users of Novell's Groupwise should also know that a version of Collabra Share that accommodates discussions within Groupwise and interacts with Groupwise e-mail is available. It also includes a custom Groupwise view for remote mail users.

NEW INTERNET CELEBRITY

In September, Netscape Communications, the vendor of the market-leading World-Wide Web browser Navigator, bought Collabra Software. Netscape's intention: to take Collabra Share's group discussion features and blend them into the next full release of Navigator. The result will be a Web browser that lets its users engage in group discussions whether they are on an internal corporate network or scattered all around the Internet. Turning the Web into a more interactive environment is a major evolutionary goal, and this is a big step. Netscape will continue to market Collabra Share as a standalone product.

Collabra Share continues to keep up with the needs of those who engage in group discussion. Its clean integration with e-mail, improved interface, and new client server architecture make it a product for buyers who are serious about bringing strong group discussion tools to their users.

THE CRITICS AGREE...



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The Mesa Group Inc.

Conference+ Professional Edition

Taking e-mail integration to the extreme, The Mesa Group Inc.'s Conference+ 1.1c Professional Edition (\$750, 10 users) exists as an adjunct to Microsoft Mail. Sharing an interface, post of-

fice, and even the administration, Conference+ is a simple but useful discussion add-on for organizations that already use Microsoft Mail.

Conference+ piggybacks on Microsoft Mail, installing on and launching from the Mail File menu. There's no standalone Conference+ application. While the program is basic, it still covers many of the

SUITABILITY TO TASK

	Conference+	
	Power	Ease
Administration	Good	Good
Conferencing	Fair	Good
Remote access	Good	Good
Outside mail integration	Excellent	Fair
Extensibility	Fair	Fair

What's Next for Notes?

By Tony Pompili

Lotus Development Corp.'s Notes, Release 4 (800-346-1305), scheduled to ship by the end of the year, will offer significant improvements for discussion database users. Release 4 has been revamped on all fronts, including development, remote access, and mail; for discussion users, the most significant changes will take place within the interface itself.

PC Magazine had a chance to work with a prerelease version of Release 4. We found that although the code isn't finished yet, most of the features and functionality are in place. On the interface side, the tabbed desktop will still have rows of database icons, but once you open a database, Release 4 will present a three-pane interface.

The Directory pane will contain duplicates of commands that were previously located on the menu bar, such as forms, views, and design elements. The directory pane also includes new private folders for creating personal stores of documents and database elements.

The View pane will look much like today's Notes view, but column widths will be customizable.

The third pane, the Preview pane, will show each document as you highlight it in the view. This will be especially useful for discussion databases since it will let you quickly move through a thread, reading documents without having to actually open up each one. Notes is incorporating read-ahead and caching technology to mini-

mize delays as you scroll through the list of documents in the view.

NEW SEARCH ENGINE

Release 4 will have a revamped search interface and engine as well. The Find command and full-text search tool will now be in the same interface, making it easier to perform simple and Boolean searches. This new unified search system will also be able to index a wide variety of attachment types, so you

possible, using a Navigator, to hide the traditional Notes interface and replace it with a Visual Basic-looking front end.

ACTION BARS

Another new interface feature, action bars, hold buttons representing actions such as opening and saving documents. Action bars will remain on the screen whether you're in a form or a view. With Notes F/X-compliant applications, they will even remain when

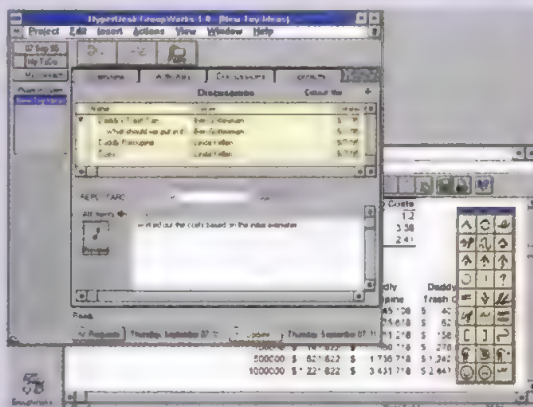
documents are opened in other applications. The new Release 4 Discussion template will make extensive use of Navigators and the action bar.

For remote users, Release 4 will have greatly simplified replication. You'll be able to stack replicas on your workspace. Previously, you needed an icon for each replica database. Notes' new SyncCenter will manage the replication. New location profiles will let you quickly switch from LAN to home to hotel configurations.

Release 4 will also improve

replication throughput with its new field-level replication. If a single field gets changed in a document you'll now be able to just replicate the field rather than the entire document.

Tightening up its own mail integration, Release 4 will support MAPI as well as VIM mail systems. That means you'll be able to replace Notes Mail with Microsoft Mail or Exchange. Notes Mail, however, will become almost cc:Mail-like in appearance and functionality.



Lotus Notes, Release 4 will feature a three-pane interface and "look ahead" technology to speed up document preview.

won't be limited to searching on the text of Notes documents only.

One of the most exciting interface enhancements is Notes' new Navigators, a palette for creating graphical interfaces that can augment or replace the three-pane system completely. For example, you'll be able to create buttons and hotspots that, when clicked on, can launch code based on LotusScript and other predefined commands that perform such functions as opening documents or performing searches. It will be

SUMMARY OF FEATURES

Group Discussion Software



■ YES ■ NO

Products listed in alphabetical order

List price (includes server price, except where indicated)

**Collabra
Share 2.0**

Server, \$995.00;
Workgroup
Edition, \$69.95
(Client/Server
Edition, \$99.95)
per user for the
first 100 users

**Conference+
1.1c Professional
Edition**

10 users, \$750.00

Lotus Notes 3
Notes Express,
\$99.00 per user
for the first 100
users; Notes
Desktop, \$155.00
(Full Notes,
\$275.00) per user
for the first 50
users

OpenMind 2.0
5 users, \$995.00;
each additional
user, \$175.00

TeamTalk 2.0a
5 users, \$395.00;
10 users, \$770.00

TeamWare 3.0
Server, \$170.00;
10 users, \$990.00

Interface

Types of discussions:

Threaded

Nonnative software users included

Types of views:

By thread order/date/author

Customizable

Message content includes:

Rich text

Attachments

OLE 1.0/OLE 2.0

Access to e-mail via:

MAPI/VIM

Types of searches:

By database/topic/full text

Cross-database/Boolean

Management

User can delete messages by date

User can move message threads within database/between databases

Administrator controls access rights

Client Platforms

Macintosh, OS/2 Presentation Manager

Windows 3.x/Windows NT/Windows 95

Server Platforms

Client/server, File sharing

NetWare (client/server)

OS/2 (client/server)

Unix (client/server)

Windows 3.x (client/server)

Windows NT (client/server)

Remote Access

Complete remote system available

Database stored locally

User can restrict access to large files

User can modify discussions off-line

Customization

Includes development system

User can customize databases

User can customize message appearance

Enterprise Capabilities

Includes enterprise-wide access control

Stores discussions in individual database

Can distribute topics among servers

Includes database synchronization

Synchronization transport

Includes remote management

MAPI Mail,
VIM Mail

Microsoft
Mail*

Proprietary

Proprietary

MAPI Mail,
VIM Mail

X.400

N/A—Not applicable. This product does not have this feature, which applies only to client/server versions.

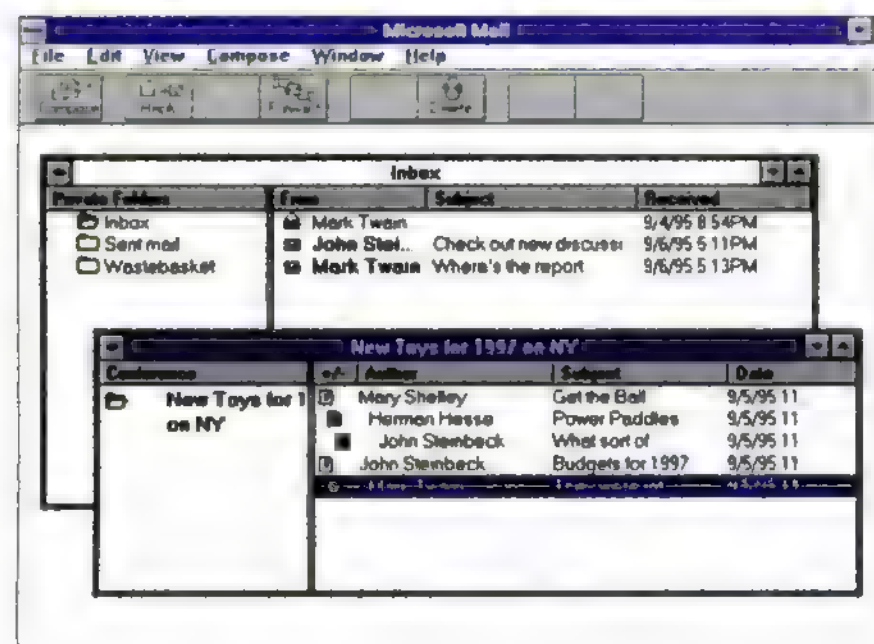
* These features are available via Microsoft Mail.

most desirable discussion software features. Users can create and administer their own discussions, and conference messages are organized in threaded views. For the administrator, sharing Microsoft Mail post offices and address lists minimizes user maintenance, and replication distributes conferences throughout the Microsoft Mail and Conference+ system.

For users, Conference+ launches within Microsoft Mail. During installation, Conference+ adds 20 or so lines to the Microsoft Mail .INI file pointing to the post office and network directory where Conference+ conferences are stored. This brings out one of the program's quirks: much of this information is not common knowledge to users. Unlike a program such as Collabra Share, Conference+ really requires an MIS expert to install it on each workstation.

INVISIBLE INTERFACE

Getting to conferences through the Conference+ interface is pretty simple. Con-



Conference+ piggybacks on Microsoft Mail, letting you share interfaces and reduce mail and discussion administration duplication.

ference+ looks identical to Microsoft Mail. It's not until you take a close look at the view area and pull down a few menus do you realize that you're even in Conference+.

FACT FILE

Conference+ 1.1c Professional Edition

List price: 10 users, \$750. **Architecture:** File sharing. **Requires:** Server: Microsoft Mail 3.0 PostOffice or later. **Client:** 8MB RAM, Microsoft Windows 3.x, Microsoft Mail 3.0 Client or later. **In short:** Conference+ provides tight integration with Microsoft Mail but doesn't work with any other mail package. The interface is simple, though sharing menu commands and buttons can be a little confusing at times. Yet the program offers most of the basic discussion features and enterprise replication for dispersed workgroups.

The Mesa Group Inc., 29 Crafts St., Newton, MA 02160; 617-964-7400; fax, 617-964-4240, e-mail, info@mesa.com

469 on reader service card

If you want to reply to this main message, pressing the Reply icon doesn't do the trick. Reply sends a Microsoft Mail reply. To reply to a conference message you have to select Response from the Compose menu.

SHARING MS MAIL CONSTRAINTS

Since Microsoft Mail is the cornerstone to Conference+, the discussion software is limited by Microsoft Mail's messaging constraints. There is no rich text, but Microsoft Mail does support attachments and embedded documents. Conference+ uses a document-embedding feature to create hypertext links or Message Links. Similar to links in Notes and Collabra

Share, these links let you imbed icons representing other Conference+ messages and then navigate to those messages by double-clicking on the icon.

Conference+ makes viewing messages convenient by offering a thread view as well as views by author, date, and subject. It would help if the system marked documents as "read" or "unread" as do most of the other products covered here. Unfortunately, threads in Conference+ only go three layers deep (message, response, and response to response), a surprising limitation.

SIMPLE USER MANAGEMENT

On the administration side, Conference+ simplifies user management by sharing the Microsoft Mail Global Address List.

Conference+ intertwines with Microsoft Mail. Some of the menu items are Conference+ and many are Microsoft Mail. While this is convenient for performing such tasks as spell-checking, we also found it a little confusing. For example, to start a new thread you hit the Compose icon shared with Microsoft Mail.

New users of Microsoft Mail are instantly available to be included in conferences. For enterprise applications, Conference+ offers you the option of using direct post office-to-post office conference replication; or take advantage of Microsoft Mail especially where direct WAN connections to other servers are not available.

All of this Microsoft Mail integration makes Conference+ a pretty tight fit for companies needing a fairly powerful discussion package that works closely with Microsoft Mail.

Lotus Development Corp., a subsidiary of IBM Corp.

Lotus Notes

Lotus Notes. Release 3 continues to represent the archetypal workgroup application. While the program's ability to handle threaded discussions is but a by-product of its much broader capabilities, Notes is nonetheless a powerful discussion package with great appeal to larger sites, especially those with an interest in creating customized discussions.

The most significant change in Notes over the last year has been a change in ownership; IBM acquired Lotus this past summer. The other big news: the introduction of less expensive runtime versions of the Notes client.

This evaluation comes on the eve of the introduction of Notes' much anticipated next version, Release 4 (see "What's Next for Notes?"), but even in its current version, Notes continues to be the most popular workgroup environment. Custom development tools built into Notes make it a popular platform for creating discussions, workflow, simple shared databases, and mail-enabled applications.

Included tools for developing customized Notes discussion databases make building them a snap; Notes has the ability to view documents in a thread view and create documents with hierarchical parent and response relationships. Its multiplatform client/server architecture supports OS/2, Windows NT, Unix, and NetWare NLM servers, as well as Windows, Macintosh, and Unix client platforms. It's a strong fit for any enterprise environment.

Notes also popularized the concept of

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CIRCLE 255 ON READER SERVICE CARD

"replication": a method of distributing information by updating copies of databases scattered all around decentralized WAN environments, improving throughput and access to data.

DATABASE CORNERSTONE

The cornerstone to Notes discussion applications and nearly any other Notes application is the database. In Notes, a database is a single file containing forms, scripts, views, help files, and documents. Everything is customizable, from the forms used to create discussion documents to the column contents, headings, colors and fonts in views.

Most sites setting up Notes for discussions start with the Notes Discussion database template, one of a dozen canned applications supplied by Lotus. The template lets you create Main Topics and

FACT FILE

Lotus Notes, Release 3

List price: Notes Express, \$99 per user for the first 100 users, Notes Desktop, \$155 (Full Notes, \$275) per user for the first 50 users. Architecture: Client/server. Requires: Server, 66 MHz, 12MB to 64MB RAM, NetWare, OS/2, Microsoft Windows 3.x, Windows NT, or Unix. Client: 386-based PC or better, 4MB to 32MB RAM; OS/2 or Windows 3.x; Macintosh, 66 MHz, 5MB RAM. **In short:** Notes is discussions and more. It's a robust, multiplatform, client/server enterprise solution. Its built-in development environment makes it most useful for companies needing to create customized discussion and other applications. Smaller sites can also now take advantage of Notes' lower price. However, Notes' interface is a little less intuitive than other products because the Notes client has to deal with a broader range of application types.

Lotus Development Corp., a subsidiary of IBM Corp., 55 Cambridge Highway, Cambridge, MA 02142, 800-346-1305, 617-577-8500; fax, 617-346-1305

470 on reader service card

then create Responses and Responses to Responses. You can then view these documents in the classic indented, threaded view form and sort them by Subject or Category. And those are just the default views. You can create your own public or private views (depending on your rights) to fit your organization's needs.

Notes discussion messages, or documents, can contain just about anything. The main message area can be rich text. Notes includes minimal word processing features, such as styles for indentation and spacing of paragraphs, as well as creating indents. A basic table feature lets

QuestMap: Lines of Communication

By Ben Z. Gottesman

QuestMap, by Corporate Memory Systems (800-293-3320), takes a unique approach to the art of discussions. Rather than presenting discussions in a textual list or threaded view, QuestMap uses a graphical map. Though the approach is certainly non-standard and takes some getting used to, it provides a feel for the dynamic of a discussion at a glance. In addition, QuestMap keeps discussions focused toward solving a problem by setting rules on what sort of statements can follow what. The program costs \$895 per user; volume discounts, however, can bring the cost down. For a group of five users, for example, the cost drops down to \$450.00 per user.

A MAPPING OF MINDS

To start a discussion in QuestMap, you create a new Map view. To make others aware of the discussion and to allow them to participate, you have two choices: You can either place the discussion in a shared area known as The Commons or mail the discussion to others using QuestMap's built-in e-mail system.

QuestMap has five primary message types: Questions, Ideas, Pros, Cons, and References. You start the discussion with a question—optimally phrased in an open-ended fashion to promote dialogue. Other users then create idea nodes which they relate to the question by drawing an arrow. Further participants then state whether they agree or disagree by creating pro or con nodes, appropriately represented by plus and minus icons. To each node, users can add further questions, ideas, and arguments.

Quickly glancing at the number of

pluses or minuses surrounding a node gives a good feel for the popularity of an idea. When the discussion reaches a conclusion, a decision node can be added to capture the message nodes that contributed to the line of reasoning for the decision. Other nodes include Notes and List



So that's what a discussion looks like. QuestMap lays it out for you graphically.

views, which help expound upon an item under discussion.

MEETING FACILITATOR

QuestMap is also useful for a meeting facilitator to capture decision processes in face-to-face meetings. And because decisions often grow out of other decisions, QuestMap lets you take a discussion and paste it into another.

On a network, QuestMap is an island unto itself. You can't add new users by reading the network bindery or e-mail directory. It doesn't have facilities for participation by non-QuestMap users via e-mail, nor does it have facilities for replication-style remote participation.

When we looked at QuestMap's predecessor, CM/1, back in 1992, it was one of the first discussion products we had come across. Now Corporate Memory Systems faces stiff competition. Though its approach is certainly unconventional, organizations may find that QuestMap actually makes arriving at decisions easier.

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PC Magazine, Editor's Choice Awards, May 30, 1995 Issue

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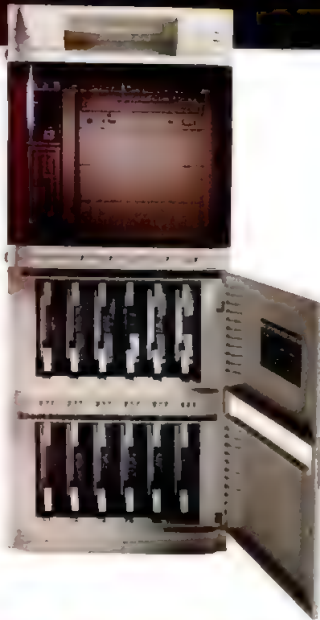
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you create Word-like tables of rows and columns. This same field can contain imported .PCX and TIFF graphics as well as embedded OLE objects. You can send or attach just about anything. Unlike other products evaluated here, You can modify forms with new fields, fonts, and graphics.

One of the shortcomings of the Notes

SUITABILITY TO TASK

Lotus Notes

	Power	Ease
Administration	Excellent	Good
Conferencing	Good	Good
Remote access	Excellent	Good
Outside mail integration	Fair	Good
Extensibility	Excellent	Good

interface is that many of the menu bar commands are generalized to deal with the range of Notes applications. TeamTalk and others are much more direct.

WORLDS WITHIN WORLDS

Notes discussions are most effective when they're conducted only with other Notes users. While it's possible to include users in discussions via optional SMTP, MHS, and X.400 mail gateways, there's no way to maintain the response hierarchy of messages responded to by outside users as can be done with products like TeamTalk and Collabra Share.

Maintaining Notes databases is relatively easy. Notes administrators can use the seven-level access control system to define everything from who can create

databases on servers to who has read, write and document and database delete rights.

The much-discussed replication capabilities of Notes are unsurpassed. Databases on a server in Chicago can be kept in sync with databases in Dallas. Documents added to one database are replicated to the other and vice versa. The replications can occur at any interval; every five minutes or every five days, it's all under the control of the administrator. Notes doesn't support only server-to-server replication. It also handles user-to-server replication for working off-line and resynchronizing.

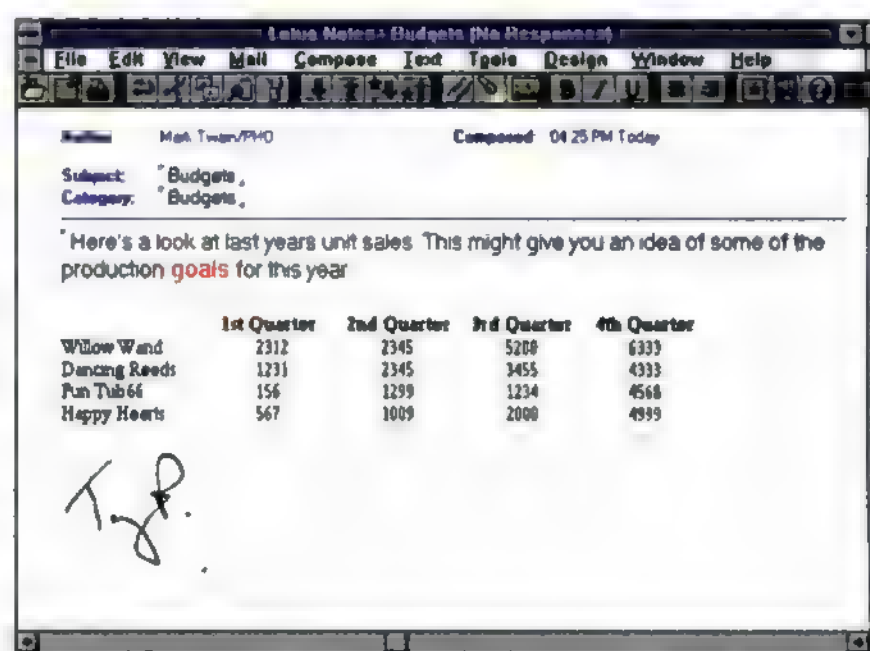
BUILT-IN MAIL

Notes comes with its own built-in mail system. The objective is to integrate it as closely with other mail systems an organization may use. Although Notes servers provide robust mail routing, many organizations opt for sticking with their existing packages. Notes mail can be replaced on a user-by-user basis with any other VIM-based package, such as cc:Mail. The current version of Notes doesn't support MAPI-based systems such as Microsoft Mail, but MAPI extensions are expected when Release 4 arrives.

One of the pleasant changes to Notes

in the last year is the introduction of Notes Desktop, a less expensive runtime version of Notes without any of the traditional design capabilities. Priced at \$155 each for the first 50 users (compared with the Full Notes license of \$275 each for the first 50 users) it's brought Notes within reach of many smaller and mid-sized sites. For discussion users satisfied with the provided discussion template, an even less expensive Notes license, Notes Express, limits users to five database types, including mail and discussion databases. For Notes discussion sites, this price of \$99 each for the first 100 users is a good deal.

As a discussion product, Notes offers a



Lotus Notes messages can contain rich text, graphics, and tables, as well as OLE objects.

powerful interface, including full-text searching and spelling checker. Some of the common-denominator compromises

GroupWorks: An Overall Organizer

By Ben Z. Gottesman

With all the client/server products in this evaluation, you might get the impression that discussion software is only for large organizations. But HyperDesk Corp.'s GroupWorks, Version 1.0a (800-832-6975), proves that even small workgroups can enjoy the benefits of on-line and archived discussions.

GroupWorks is not just a discussion product. Instead, it aims to give its users tools to organize all the elements of a project, including meetings, tasks, and outside contacts.

The program doesn't require an administrator to install it. Each user

installs a copy of GroupWorks on his own workstation. Systems talk to one another across the network using HyperDesk's proprietary extensions to OLE, called Network OLE. There's no need to place any files on a file server.

FOUR-PART PROJECTS

Any user can create a new project. Each project has four tabs: Overview, which includes a description of the project, participants, and milestones; Activities, a mini-project manager; Discussions; and Contacts, for contact management. Each module is surprisingly deep and should satisfy most users.

The Discussions module supports full threaded discussions. Threads can expand or collapse for readability. Messages can be private, thus only available to the author (useful for drafts), or public, at which point they're made available to everyone who has access to the project. New messages show up on other users' screens almost instantly, marked as unread. Unfortunately, there's no color coding to identify new messages.

GroupWorks doesn't support rich text in messages, but the program has very good support for attachments, which can be linked or embedded OLE

Notes makes result in an interface that's a little clumsy for some users, but most won't mind when they come to understand its power.

Attachmate Corp.

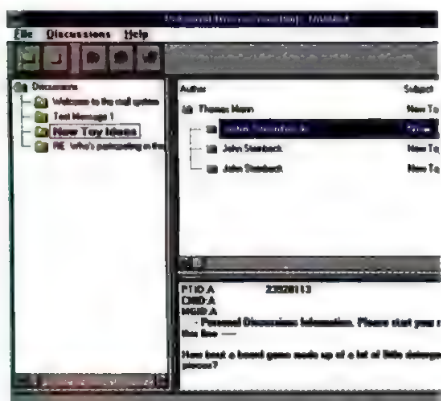
OpenMind

Attachmate Corp.'s OpenMind goes beyond basic discussion tasks to make managing documents as easy as managing messages. OpenMind not only offers powerful discussion features but also delivers document management and access to the Internet.

OpenMind is a client/server application running on a Windows NT server and accessible by either a Windows 3.x or Macintosh client. Its discussion environment, called the Mind, is a container for holding hierarchically organized discussion sections and threads. It also serves as a document management system and integrated World-Wide Web browser. OpenMind includes enterprise replication, MAPI and VIM electronic mail gateways, and built-in remote access. With OpenMind, Attachmate has successfully created a well-rounded system for managing many types of group information.

SIMPLE BUT POWERFUL

OpenMind's client interface is relatively simple but powerful. Messages get created and appear in a Transcript view. As with TeamTalk, you can expand this view



GroupWorks manages every aspect of a project including meetings, tasks, discussions, and contacts. The GroupWorks Reviewer (background) lets users mark up documents.

FACT FILE

OpenMind 2.0

List price: 5 users, \$395 (each additional user, \$175).
Requires: Server 486/66-based PC or better, 16MB RAM, 8MB hard disk space; Microsoft Windows NT Client 286-based PC or better, 4MB RAM, 8MB hard disk space, Windows 3.1 or later. **In short:** OpenMind expands its role as a discussion application to support document management and connections to the Internet. Built-in viewers nearly guarantee that anyone can view any attached or file document. WWW pages can be included as part of any section—giving users integrated Internet information along with their native OpenMind messages and files. The interface, however, could be enhanced with better integration with third-party VIM and MAPI mail directly from the desktop.
Attachmate Corp., 3617 131st Ave. SE, Bellevue, WA 98006, 800-426-6283, 206-644-4010, fax, 206-747-9924; e-mail, info@attachmate.com
471 on reader service card

to display the actual text of each message or item; You can read items and responses to them without opening and closing documents or looking at documents in a preview pane.

Attachmate recognizes the connection between discussions and document management. Since documents are often the subjects of discussions, OpenMind lets you create folders to store documents pertinent to a discussion. Documents, such as word processing or spreadsheet files, get stored in folders and

are automatically versioned so that you can store and open previous versions of a work in progress. No other product evaluated here has this feature.

Also unique to OpenMind are viewers that let you open and read facsimiles of documents even if you don't have the actual application. You can't edit these documents, but you can see and print them. No discussion participant need be left out in the cold.

You can also attach files to discussion items, but items don't support rich text or embedded objects, and that limits what you can actually put into the body of a message.

For those times when you want to step out of a public discussion and carry on a semi-private side conversation, OpenMind provides what it calls Personal sections. Sort of like built-in e-mail, the standard Personal section lets you create a message and then choose whose personal section you want to send it to.

SUITABILITY TO TASK

Open Mind

	Power	Ease
Administration	Good	Excellent
Conferencing	Good	Good
Remote access	Good	Excellent
Outside mail integration	Excellent	Fair
Extensibility	Fair	Fair

INTERNET ACCESS

When it comes to the World-Wide Web, OpenMind has the most complete set of tools of any product reviewed here. It includes a built-in Web browser that you can use if you have a network or dial-up TCP/IP stack already set up. You can also link

objects. (Network OLE allows objects on one user's system to be opened on another.) In addition, you can create a Review Copy of a file, an image you can't edit, but that anyone can mark up with an extensive array of annotation tools.

USEFUL LINKS

Like Lotus Notes' DocLinks, GroupWorks lets you link tasks and contacts to messages. If you're discussing the results of a meeting, for example, you can link to the meeting card that contains the minutes of the meeting in an attachment. Similarly, if you reference someone in a message, you can link to that person's record in the contact manager.

External users can be involved in GroupWorks projects via a VIM or MAPI connection, but this service is limited to notifications of new projects, tasks, and meetings. They can't participate in discussions.

You can take a project with you to work on off-line. Any changes you make are merged into the project once you return to the network.

HyperDesk has done a good job opening up the world of groupware to small organizations. Its tight integration of discussions with other project data enhances its usefulness. HyperDesk has lowered GroupWorks' cost to \$199 per user and a 30-day copy can be downloaded free via the Internet (<http://www.hyperdesk.com>).

Web pages directly into discussion sections. When you access such a page, the browser automatically activates and brings the page up. This lets you integrate public Web pages into your proprietary OpenMind discussions, a great feature.

Your e-mail is available to you on the server. OpenMind uses VIM and MAPI on the NT server to give e-mail users access to Mind sections. As in Collabra Share, not only can e-mail users receive and respond to discussion threads, but they can also generate section queries by embedding commands such as "Search" in an e-mail message. This gives users of third-party e-mail packages much of the same functionality that native OpenMind users have.

Unfortunately, desktop integration between third-party e-mail packages and OpenMind is limited. There is no menu item on the mail side to start a discussion the way you can with Collabra Share or Conference+. This makes it more difficult for avid e-mail users to easily integrate

How to Have a Personal Discussion

By Tony Pompili

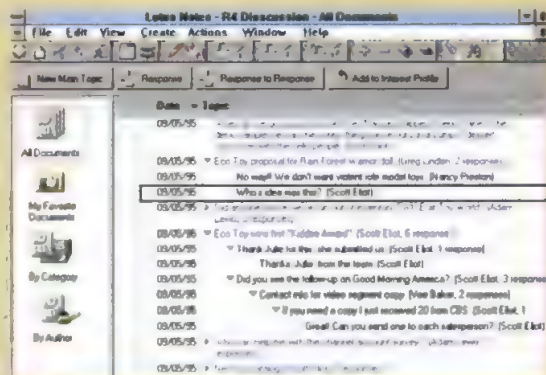
Microsoft Mail users who want group discussion tools without the hassles of network and mail administrators will find Discussions Corp.'s Personal Discussions 1.0 (\$495 for ten users) a good choice. All of its discussion capabilities stay with the end user, eliminating the need to mess with Microsoft Mail post offices or servers. Personal Discussions was not yet released at the time of our evaluation but will be shipping by the time you read this.

WORKING WITH MICROSOFT MAIL

Like The Mesa Group's Conference+, Personal Discussions installs on your Microsoft Mail File menu and only works with Microsoft Mail. What's interesting is that Personal Discussions doesn't create centralized discussion databases the way Conference+ does. Instead, it uses Microsoft Mail ID information to build threaded views of your mail file. The software converts messages and message replies into threaded views. These views only apply to the individual user's mail file.

Because the software lives on the end user's PC, Personal Discussions works with either LAN or remote Microsoft Mail. When you select Discussions from the File menu, the discussion application launches and rearranges your documents in threaded views. Main documents get

converted to discussions, and subsequent layers of replies convert to threads and responses to threads. Messages are generated in Microsoft Mail, and Microsoft Mail icons are used for sending and replying to messages.



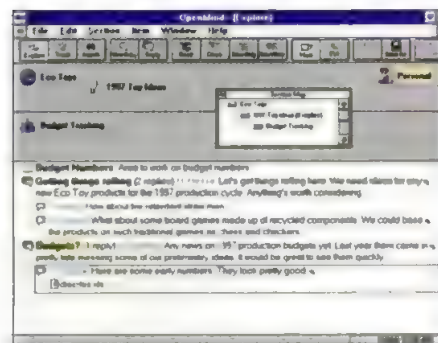
Personal Discussions is the easiest way to turn Microsoft Mail into a discussion tool.

DIFFERENT KIND OF CONFERENCE

Personal Discussions works on a different conferencing paradigm than any of the products we evaluated. Whatever is in an individual's mail file constitutes the discussion. A person who joins a discussion by being included in a mail message starts seeing the discussion at the point that he was included. Whatever gets to your mail box is the discussion that's underway.

For Microsoft Mail users who want to organize their mail in a threaded view, Personal Discussions is a good utility, but just don't expect a traditional shared database approach.

Contact Discussions Corp. at 503-690-4668. E-mail: info@discussions.com.



OpenMind's hierarchical sections contain messages as well as files that are being managed by the program.

their discussion activities with their mainstay e-mail work.

On the networking side OpenMind is fairly flexible, supporting IPX/SPX, IP, NetBIOS, AppleTalk, and asynchronous dial-up. OpenMind uses a remote access approach to let mobile users remain involved with discussions while on the road, the same way Collabra Share does. Whether on the road or connected to the LAN, you log in to one server at a time and work with a single Mind, unlike a product such as Lotus Notes that lets you log in to a network and get access to multiple servers simultaneously.

To spread the word across an entire en-

terprise, OpenMind supports section directory replication. OpenMind uses its own direct replication system, similar to those in Notes and Conference+, bypassing the need for a third-party e-mail system.

Attachmate has done a good job of creating a product that encompasses the basic and peripheral tasks associated with

discussions. Its document management and viewers let you include a variety of document types that will naturally be involved with the discussion process. Better e-mail integration directly at the desktop would go a long way toward rounding out OpenMind's full feature set. After all, out of site is out of Mind.

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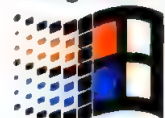
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Trax Softworks Inc.

TeamTalk

TeamTalk, from Trax Softworks (5 users, \$395.00), takes a back-to-basics approach to group discussion. With new features, such as threaded discussions, TeamTalk 2.0a is now simpler and more intuitive to work with, and continues to be useful for smaller workgroups.

TeamTalk takes the task of running workgroup discussions quite seriously. It displays discussions in intuitive, outline-like threads. In expanded view, the full text of documents (including icons, graphics, and attachments) shows up to give the reader the feeling of an ongoing conversation.

SHARED-FILE ARCHITECTURE

The TeamTalk system uses a shared-file architecture so it works best in environments where users have direct access to a common file server, such as a NetWare server. While it can extend discussions out to generic e-mail users, such as Microsoft Mail or cc:Mail clients, and perform rudimentary replication, its management and overall architecture perform best in single-server environments.

Trax puts emphasis on a strong discussion-oriented interface. Discussions, or "Topics" in TeamTalk-ese, now have a familiar discussion-like appearance with indented, threaded responses or replies similar to those in Collabra Share and Notes. We found the interface to be

SUITABILITY TO TASK

TeamTalk

	Power	Ease
Administration	Fair	Good
Conferencing	Good	Excellent
Remote access	N/A	N/A
Outside mail integration	Good	Good
Extensibility	Fair	Fair

quite intuitive. The TeamTalk client supports only Windows 3.x clients, and while Trax is working on a Windows 95 version, no release date has been announced.

The multipane user interface has a thread windowpane that graphically maps out threads and pinpoints your position in the threads at all times—a handy navigation tool to have, especial-

By Tony Pompili

With its new FirstClass 3.0 for Windows, SoftArc (800-763-8272) is making the move to the PC. Though unable to give it a full review because of its late shipping date, we did spend time with the prerelease version.

This popular Macintosh discussion and BBS software has retained much of its Mac-ish look and feel, as well as its built-in customization and dial-up tools. It also has extensive user configurability, allowing over 20 separate attributes. FirstClass supports several mail gateways, including Microsoft Mail as a fax and Internet gateway, but currently doesn't provide VIM or MAPI interfaces at the desktop. The product adheres to the Mac interface standard, but lacks many PC client features, including rich-text messages, imbedded OLE objects, and hierarchical threaded views.

FirstClass uses an incredibly simple interface for supporting discussions, or Conferences. Conference views look like Macintosh folders; messages appear in these folders in the same way that files appear in Mac folders.

SHARED CONFERENCES

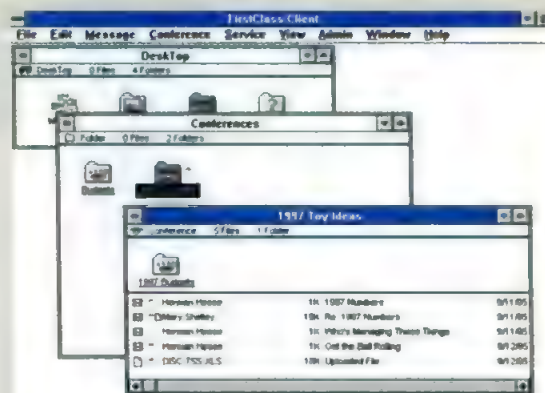
Conferences are essentially shared mailboxes, much like Conference+'s conferences. Messages resemble mail for the most part. Red flags next to messages in views highlight unread messages. Creating and replying to messages is pretty simple, but the resulting discussion appearance is almost too simple. Messages, unfortunately, do not appear in views as threads. FirstClass does include a variety of views for sorting messages by date, subject and size, for example.

E-mail is a separate area within FirstClass. The mail interface lets you

send and receive FirstClass and other mail using server-based gateways. A hook for moving between e-mail and FirstClass in packages like cc:Mail would be helpful, however.

Both Conferences and mail can be enhanced with FirstClass' Designer software, which comes standard with the package. Designer allows you to customize and create new message forms. These can be used in existing Conferences and made available to other users.

FirstClass 3.0 servers, out of the



FirstClass for Windows maintains some of its Macintosh heritage on the PC side.

box, work only with Windows clients. Macintosh and a command line interface can be optionally installed for \$295 each. Strangely missing for an NT server is NetBIOS. Using FirstClass' built-in replication, you can distribute Conferences to multiple servers. Optionally, SoftArc also provides Internet Usenet and mail and fax gateways.

Priced at \$495 for a single server, five users, and the Windows 3.x interface, FirstClass 3.0 brings basic discussion and e-mail capabilities to the desktop. PC users may find the Mac interface inconsistent with their other applications, but its detailed user control, remote access and BBS support make it a good addition for predominantly Mac shops wanting to bring their PC cousins into the fold.

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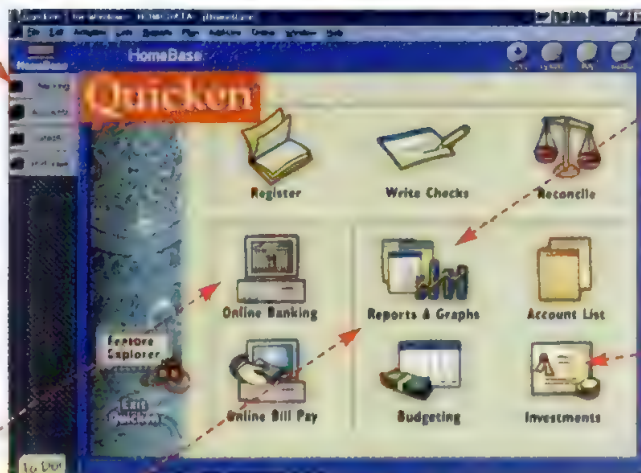
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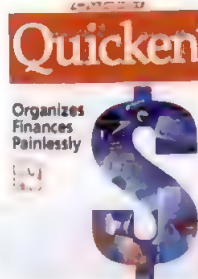
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Group Discussion

ly in long, complex discussions.

While the default for displaying Topics in TeamTalk's Conversation Pane is an expanded, verbose view, the collapsed view reduces the screen to a simple one-line listing for each message for quick perusal. Consistent with the product's emphasis on ease of access, the interface includes buttons for showing new addi-

and what rights, such as just reading or reading and creating messages, these users have once in the Topic.

HOOKS TO E-MAIL

Since the world is revolving more and more around e-mail, non-TeamTalk users are drawn into the fold by TeamTalk's API hooks to MAPI and VIM systems including

Microsoft Mail, cc:Mail and Lotus Notes. A downside to TeamTalk's ability to send discussion messages to e-mail users is the licensing scheme. Each mail user takes up one TeamTalk license. By comparison, TeamTalk's \$770 for a ten-user license is hardly a budget killer.

E-mail plays an important role in TeamTalk's enterprise implementation strategy. Like Collabra, TeamTalk uses e-mail as a method for creating crude replicas of one or more selected topics. Topic messages are copied as mail messages and sent to the mail system

system for transport, it's also at the mercy of the mail system.

Remote users, are, in essence, third-party e-mail users. There is no remote package nor any built-in dial-up system for accessing and updating, or replicating, Topics. Users on the road will find TeamTalk far less convenient to use than a product such as Notes.

TeamTalk is a focused discussion product geared toward small groups. With fun touches such as plants and a water fountain in the office and a palette of discussion-enhancing graphics (including emoticons called Stickers), the product is enjoyable to use.

Enterprise sites in need of a solution will need a product with a more robust discussion distribution system and better centralized management of users and the discussion system itself, but smaller sites will find TeamTalk to be a useful group discussion package.

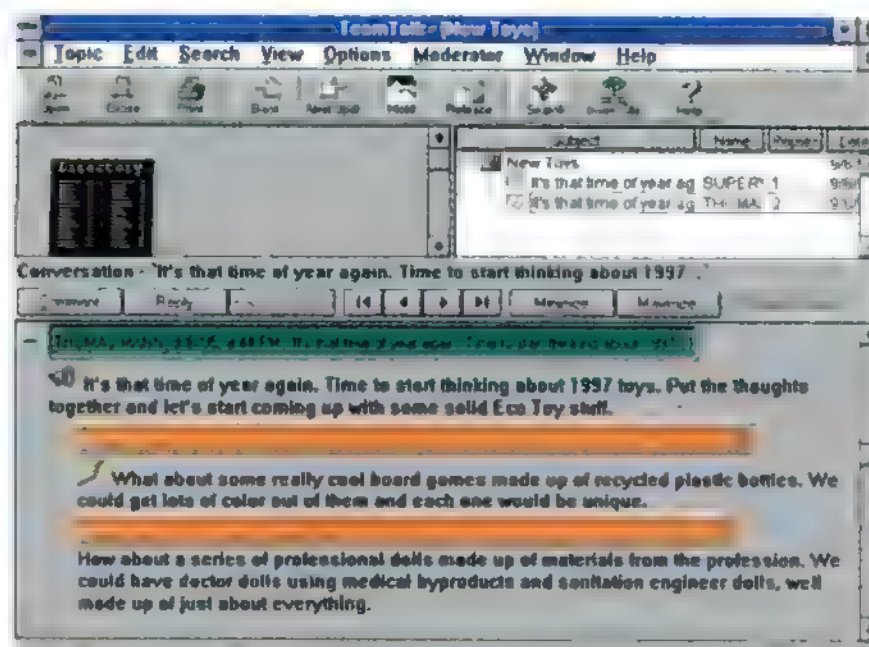
TeamWare Division, ICL Inc.

TeamWare

TeamWare's latest version, 3.0, leaves no groupware stone unturned in offering discussion, calendaring, e-mail, and document management in a single package. TeamWare's simple interface gets users up and running quickly, but its proprietary design makes it less useful to the majority of users already committed to existing e-mail packages. Without hooks to other e-mail standards, you must commit to the TeamWare strategy (which may not be a bad plan anyway).

The TeamWare Office groupware suite is a component-based system that lets you select just the application options you want. The product has two components: the basic server and the application packs. All of the basic servers have a client/server architecture running on Microsoft Windows NT, OS/2, NetWare, and Unix servers.

The "pick and choose" application packs add the real meat to the server. They include discussion, document management and routing, e-mail, and calendaring. While most of these applications run on Windows 3.x, Macintosh, and Unix workstations, the discussion software, TeamWare forum, runs only under Windows 3.x, making it useful for PC environ-



TeamTalk's expanded view gives you the complete text of the Topic messages. You can enhance messages with graphics and embedded objects.

tions and for navigating from update to update.

The TeamTalk search engine is still one of the most comprehensive and powerful of the group tested. We were able to create simple and Boolean searches across a single topic or across multiple topics. TeamTalk compiles the results into a single view, but lets you toggle between the selected search group and the messages in the context of the actual topic.

FREE-WHEELING

Discussions are spontaneous and user-driven, and TeamTalk's management environment reflects this. Nearly anyone can create new Topics and become lord and master over their Topics. Self-proclaimed TeamTalk Supervisors decide what individuals or groups can access the database

using your choice of mail API. The recipient of the mail, another TeamTalk system, uses imbedded ASCII tags to position the messages correctly in the local discussion system, maintaining the Comment and Reply relationships.

Since TeamTalk has no server and can't run processes, this whole mailing scheme, used among TeamTalk systems and mail users, relies on a group mail transport agents to route mail for the TeamTalk system.

The system is crude, with no actual direct comparison of Topic versions among decentralized systems, as would happen in a Notes replication, for example, to ensure that the databases were indeed up to date. And like Collabra Share, building on e-mail is a double-edged sword. While it benefits by exploiting the existing mail

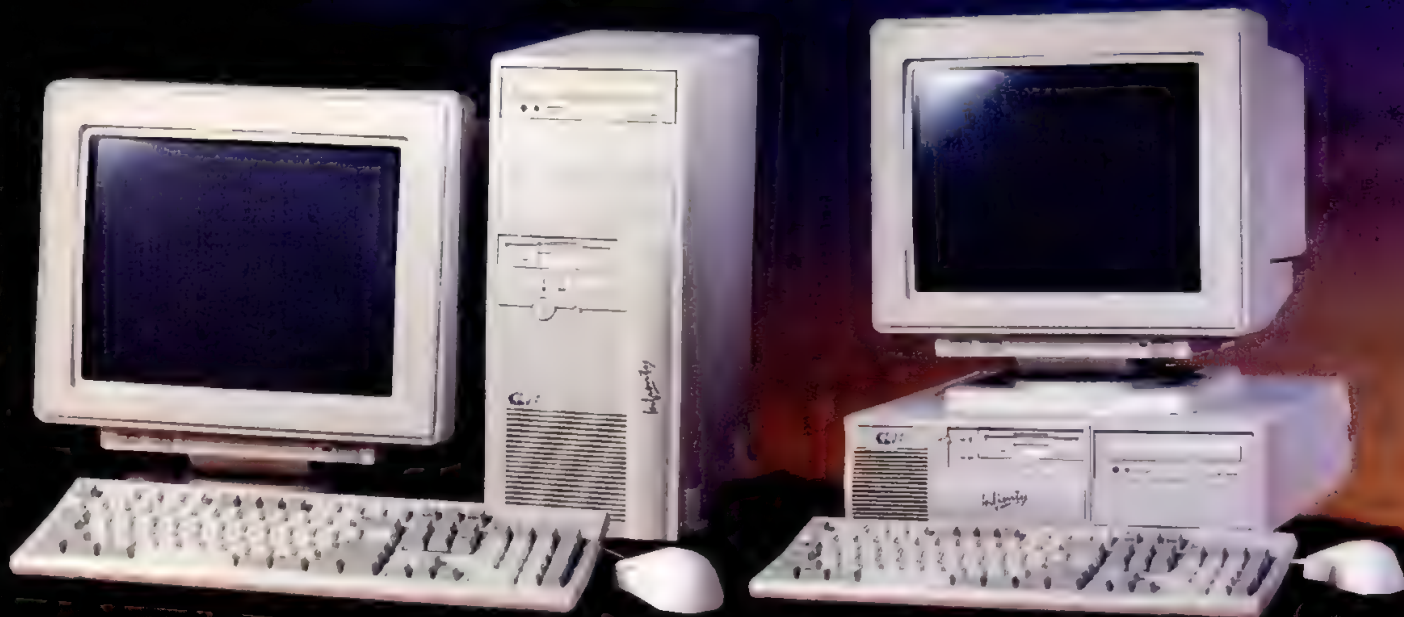
FACT FILE

TeamTalk 2.0a

List price: 5 users, \$395, 10 users, \$770. **Architecture:** File sharing. **Requirements:** Client: 386-based PC or better, 8MB RAM, Microsoft Windows 3.1 or later. **In short:** TeamTalk is a strong discussion system that's useful for small workgroups of users. Discussion users of all levels will appreciate TeamTalk's ease of use and noteworthy features—among them an intuitive discussion interface with a new threaded display, support for OLE 2.0 and rich text formatting of messages, and powerful search and graphical navigation tools. Non-TeamTalk interface users can participate via third-party mail systems. However, the product's lack of discussion distribution, a centralized user, and discussion management will hinder larger sites.

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SOFTWARE

Group Discussion

ments but not for others.

A major shortcoming of the product is its lack of support for many popular application integration tools such as extensive MAPI or VIM, or OLE. From the user's perspective, as well as from an administrator's perspective, TeamWare is clearly designed to be an island unto itself.

FORUM APPLICATION PACK

We focused on the forum Application Pack. The product is simple, with an interface that resembles most popular e-mail packages. Discussion topics, or forums, are listed in the left pane, and the actual messages are listed in the right. Creating new messages is as simple as selecting the forum, positioning the cursor and then selecting Write from the Message menu bar. A Sort command reorganizes messages by Date, Writer, or Subject.

FACT FILE

TeamWare 3.0

List price: Server, \$170; 10 users, \$990. **Architecture:** Client/server. **Requires:** Server: 486-based PC or better; 16MB RAM, Network, OS/2, Microsoft Windows NT, or Unix. Client: 386-based PC or better, 8MB RAM, Windows 3.1 or later. **In short:** TeamWare is a mix-and-match component groupware system including discussion capability. A consistent but bare-bones interface makes moving among applications simple for users, but the absence of support for rich text or OLE in messages makes for an unpolished interface. For companies that already have mail systems, integration with TeamWare will prove difficult, as the product lacks full support for VIM or MAPI.

TeamWare, 800 Central Expressway, MS 33-42, Santa Clara, CA 95052; 800-240-8326, 408-982-3026; fax, 408-982-9946; e-mail, teamware@ix.netcom.com

473 on reader service card

TeamWare's interface is a little rough around the edges, however. For example, the forum supports threaded messages but it doesn't use the traditional, hierarchical indented format in the message listing itself. Instead, icons with combinations of left- and right-facing arrows tell you whether a message has received responses or whether it has responses to responses.

These same icons appear when the messages get resorted, thereby making the whole thing a little confusing. In a similar vein, nothing in TeamWare re-

freshes instantly. If you create a new message and return to the main screen, it won't appear in the message window until you double click on the forum name.

The messages themselves are reminiscent of some older e-mail packages such as 3Com's 3+Mail. Attachments can't be embedded in text; you have to specify them in the Attachment field. As a matter of fact, nothing but plain ASCII text can go into the message area; it's impossible to add fonts, colors, or imbedded objects or graphics. One nice feature about TeamWare's message, however, is the "Reply Requested" line that directs replies to your messages either

to the forum or to your mailbox. It's a nice crossover tool for turning part of a discussion private when necessary.

NEW FORUMS

As with products such as TeamTalk, nearly anyone can create new forums (as long as the administrator allows such rights) and regulate access to them. A unique forum-management tool for users—TeamWare's optional forum rating system—lets users mark forums and individual messages as "Interesting." This rating lets the users filter out everything that someone hasn't deemed "Interesting."

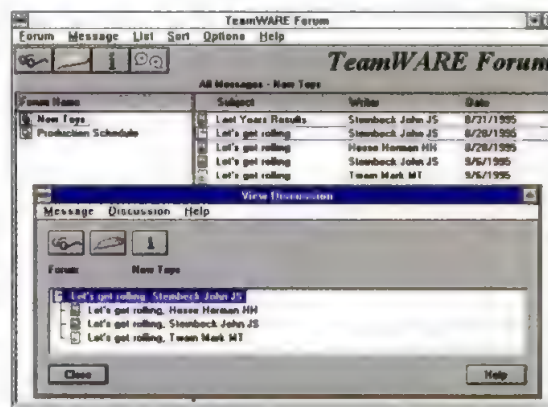
TeamWare recognizes the importance of tightly integrating e-mail with its forum discussion applications. The interface of the mail application is nearly identical to that of the forum. As mentioned, however, if you already have a mail interface such as cc:Mail or Microsoft Mail, you can't tie it into the TeamWare system. The company plans to address this shortcoming in the following year.

SUITABILITY TO TASK

	TeamWare	
	Power	Ease
Administration	Good	Good
Conferencing	Good	Good
Remote access	Good	Fair
Outside mail integration	N/A	N/A
Extensibility	Fair	Fair

GATEWAYS AVAILABLE

TeamWare does offer an optional X.400 gateway for getting from TeamWare to third-party e-mail systems. This gateway



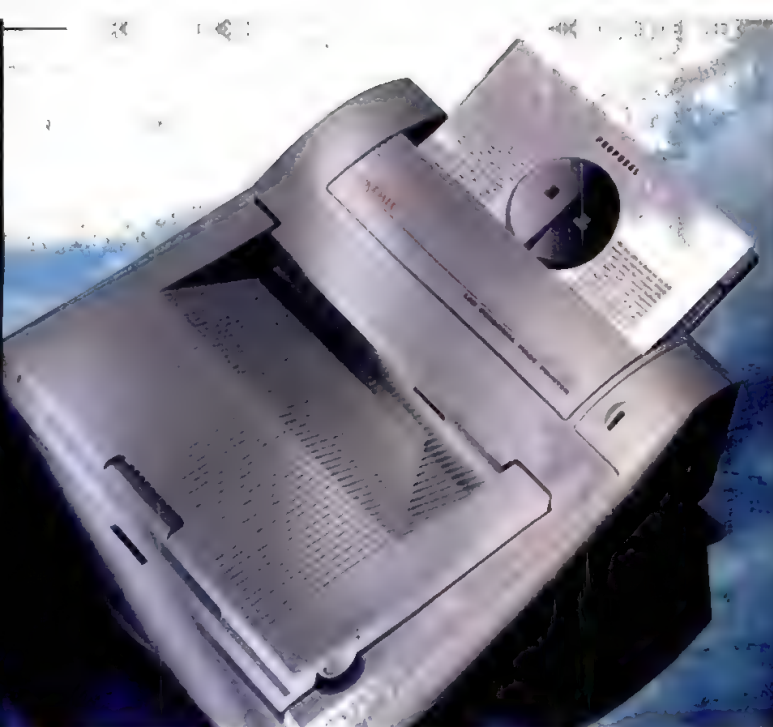
TeamWare's main view is supplemented with a View Discussion window to map individual threads.

also serves as the basis for TeamWare's enterprise strategy. The gateway joins forces with a directory synchronization and replication process; this process provides the transport for updating or for replicating forums from one server to another. Similar to Collabra Share's approach, TeamTalk takes advantage of X.400 mail backbones for those organizations that have already implemented them.

Remote access to TeamWare is available (though only on Windows NT and OS/2) through a proprietary program called Relay. It lets you dial in and use forum interactively, but you can't work off-line with a replica as you can with Notes.

SYNCHING ON THE ROAD

TeamWare also offers a series of utilities called TeamWare Assistant that simplifies synching your notebook for use on the LAN and then on the road. TeamWare Assistant demonstrates the product's overall focus on providing as much functionality as possible as a single groupware product. That strategy may work for organizations just starting up with group discussion, but unfortunately, it's less useful for the majority of companies that are already using an e-mail package. TeamWare's lack of support for MAPI and VIM APIs will not fly with organizations looking for a more open discussion product. □



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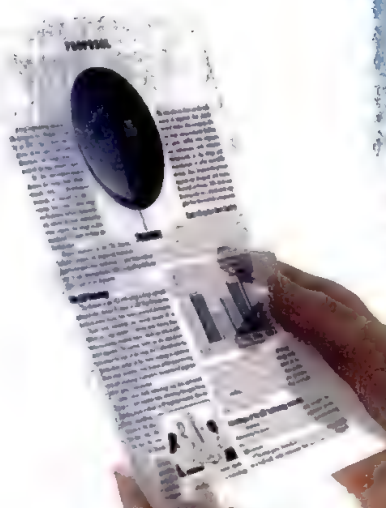
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NETWORK MANAGEMENT

LAN Tamers

These five management suites can help make your network purr.

By Steve Rigney

If you've ever felt that managing your network is like trying to get dozens of lions to jump through a single flaming hoop, you're not alone. After all, in both activities you have to keep track of many things at once.

In this roundup we look at five network management suites whose goal is to help the network manager take control of the LAN. Network managers spend much of their time walking from PC to PC to distribute software, check hardware inventory, scan for viruses, and troubleshoot problems. This leaves them little time for important tasks such as planning for upgrades or designing and implementing

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HIGHLIGHTS

Network Management Suites

You want to control everything on the network from one place, and you need to be sure that downtime has been planned in advance—you don't want the unpleasant surprise of a server crash.

INTEGRATION continues to be the underlying strength of network management suites, and it gets better all the time. Besides providing a complete palette of tools at an attractive price, suites ensure that the tools function together to share information and tasks. The best suites act as a single application with integrated reporting and alerting features and let optional modules—either add-ons or products from third-party vendors—plug into their structure.

EASE OF USE and installation for these products have improved. Most suites have graphical displays that show you real-time information instantly, and most let you access information about your LAN inventory quickly from logically arranged categories. Two products—BrightWorks and Saber LAN Workstation—include help-desk modules for tracking solutions to common problems. One of the best features we saw is LANDesk's method of software distribution, which eliminates the need for complex script programming by using before-and-after profiling of a single installation job. If you prefer, LANDesk does include a well-documented scripting language.

new software systems.

Network management suites provide utilities that can keep your tools in one place. They can inventory hardware and software on the network and distribute new software and upgrades to network clients from a central location. They can provide network and server performance statistics to help managers troubleshoot existing problems or detect potential problems before they occur. They can automatically monitor and control software

SUITES ARE INCONSISTENT in which management utilities they include—although all of the products in this year's review can perform inventory, software distribution, and metering. The strength of the tools the suites include can also be hit-or-miss; you'll want to find a product that addresses each of your management needs well.

MULTI-NOS or multisite environments have different needs from single-site NetWare LANs. The Norton Administrator for Networks (NAN) and The Frye Utilities for Networks (FUN) perform a variety of management tasks over a wide-area network and can work with multiple NOSs and client OSs. Microsoft has tailored Systems Management Server (SMS) to enterprise networks running Windows NT, and Novell has introduced ManageWise, which integrates a gamut of tools for monitoring desktop PCs and network devices such as bridges and routers on a NetWare network.

SPECIFICATIONS such as Plug and Play (PnP), the Desktop Management Interface (DMI), and Compaq's Intelligent Manageability (IM) can make it easier for these suites to gather more information about client PCs than ever before. As more PC systems include these information-gathering features, management suites will be able to provide much greater detail.

usage to ensure that a company stays in compliance with the law while retaining the minimum number of licenses it needs. Finally, these packages can analyze and present all this data in graphical reports that can be invaluable at budget planning sessions.

Some important management features are already built into NetWare and Microsoft Windows NT server. For example, you can use NetWare login scripts to launch certain applications and per-

form some rudimentary software distribution when a user logs on to the network. Windows NT's Event Viewer and Performance Monitor can do sophisticated server monitoring. You can also use NOS utilities to limit access to certain network resources and keep track of which users are connected and what files they use.

But while most NOSs offer some utilities for monitoring and controlling your file servers, they are generally not as full featured or easy to use as the utilities in many of these management suites. And NOSs provide very little ability to track and control client PCs.

SWEET SUITES

When the first network management products entered the market, they were sold as standalone packages that offered one or two management functions. If you wanted to perform multiple management tasks, you had to purchase several packages, often from different vendors, and switch between the programs on your desktop. Data from each program was kept in a separate database, so it was difficult or impossible to create reports that would pull data from, say, your software inventory and application metering databases. Fortunately, network management vendors began to realize that there was some advantage to bundling these various utilities into a single suite.

REVIEW CRITERIA

In our search for the best network management suite, we looked for packages that provided at least four of the following seven important management functions, either as part of the main package or as options.

There are several types of utilities for inventorying software and hardware on the network. *Software inventory* utilities scan directories on the server and clients and match .EXE files to a database of known applications. *Hardware inventory* utilities interrogate the client PC's BIOS and subsystems to provide reports on the amount of memory installed and the available hard disk space. Many of these utilities also look for special hardware drivers in memory. In all, they give the network manager a complete record of

LANDesk Management Suite 2.01

In evaluating network management suites, we looked for a collection of utilities with a depth of features, delivered as a single, integrated whole.

LANDesk Management Suite 2.01 is our Editors' Choice for its unbeatable combination of strong features, excellent integration, and ease of use. LANDesk was the only product we reviewed that covered all the management tasks we were looking for in its base package. Its unique software distribution method, which records changes to a PC from a single installation and duplicates them across the LAN, eliminates the need to learn a scripting language. LANDesk provided the most extensive server-monitoring information of all the products reviewed and was the only one able to create DMI-compatible inventory files.



LANDesk was also the best-integrated product we saw. The customizable interface, which resembles NetWare 4.1's tree structure, is context-sensitive. Most LANDesk tools share information and can export it directly to the report writer or trigger the alerting

module. Lack of integration between the software inventory and metering data, however, is one of the few strikes against LANDesk. Full compatibility with Windows 95 is expected soon.

Keep in mind, though, that LANDesk is a good choice only if NetWare is your primary network operating system. For more heterogeneous networks, you should consider The Norton Administrator for Networks 2.0 (NAN), which is protocol- and NOS-independent. NAN, which receives an honorable mention, has well-integrated enterprise-wide features with tools like Site Manager, which congregates information from distributed sites. Poor alerting features—as well as lack of network statistic and server-monitoring tools—leave it an incomplete package, but although some features are not included in its base product, Symantec sells several additional modules that integrate into the core suite.

the hardware and software installed on the network, which he or she can use for troubleshooting and planning.

Software distribution utilities automate the process of installing and updating various application programs across the network.

Application-metering utilities monitor the use of software on the network. The network manager can use them either to gather usage information or to actually control software use in order to ensure that the company is in compliance with the law.

Network statistics utilities identify specific nodes by their adapter address, alert the manager to unauthorized access, iden-

tify usage trends, and help isolate cable problems. They can also help the network manager spot traffic trends and troubleshoot problems.

Server-monitoring utilities provide information about servers' network traffic, CPU utilization, file system performance, memory allocation, and hard disks. You can also set thresholds on parameters to prevent problems before they occur.

Client-monitoring and control utilities give the administrator remote control of clients both over the LAN and over a modem link, letting him view statistics, modify configuration files, and reboot clients if necessary.

Virus-checking programs help alert the

Perhaps the best example of the modular suite approach is The Frye Utilities for Networks (FUN), which has been our Editors' Choice for the past two years. FUN's individual modules are strong by themselves and have remarkable synergy when used together. But FUN's DOS interface is withering against its graphical competition. Frye has introduced The Frye Network Management Platform, a Windows-based suite, but it is not yet a complete solution and is incompatible with the DOS-based FUN.

BrightWorks 2.1, from McAfee, received good marks for NetWare management. But while it has good software distribution, application metering, and inventory tools, the integration among these tools is only fair. Reporting features were good, however, and BrightWorks bundles HawkNet's NetTune, a flexible server-monitoring tool.

Saber LAN Workstation (SLW), recently acquired by McAfee, remains a good tool for brandishing control over DOS and Windows client desktops. But although it works with multiple NOSs as well as with Novell's NDS, its LAN management tools are not as powerful overall, and its installation continues to be complex and tedious.

manager to possible viruses and eradicate them. They can also be used to schedule scans across the network.

We required that each product offer some integration among the modules, either in the form of a common interface or the ability to share data; run on the Intel x86 platform; run on DOS or Windows-based PCs; and work with NetWare 3.12.

Our search led us to five products: McAfee's BrightWorks 2.1, Frye Computer Systems' The Frye Utilities for Networks, Intel's LANDesk Management Suite 2.01, Symantec's The Norton Administrator for Networks 2.0, and McAfee's Saber LAN Workstation 5.0B. Two products we reviewed last year did not make this roundup: Symantec's LAN-lord is being discontinued; and Cheyenne, which makes Monitrix for NetWare, declined to participate.

In two sidebars we also examine the

Our Contributors: STEVE RIGNEY and PADRAIC BOYLE are contributing editors of *PC Magazine*. GREGORY C. ALWANG is a senior consultant and principal, and ROBERT L. MORRISON, CNE, and TODD COLUMB are consultants at SOFT Industries, a network consulting firm based in Connecticut. LEON ERLANGER was the senior associate editor in charge of this story, and JEFFREY G. WITT was the project leader.

NETWORK MANAGEMENT

Suitability to Task

We rated each suite on seven tasks that we found to be most common among the products tested. Not every suite does all seven tasks, so we've indicated an N/A where a task is not claimed to be a feature of a particular package. You'll need to determine which tasks are important in your environment. Our final rating consid-

ers how well the package integrates these functions—an important selling point when comparing suites with individual utilities. We rate only the core suites that are offered; add-ons for tasks such as remote control or virus scanning may be available separately from the company.

Hardware and software inventory are powerful tools that help network managers keep track of what they have and what changes should be made to plan for future upgrade needs. We give extra points to those that can address standards-based Desktop Management Interface (DMI) products or hardware vendor applications such as Compaq's Intelligent Manageability (IM) or IBM's NetFinity. We look at which NOSs and desktop operating systems each package supports and whether the inventory utility runs in real time or solely on demand. We take into account the quality of the inventory information gathered—how extensive it is, how easy it is to access, and whether it is available to other modules in the suite. For hardware, we also consider whether a product looks just for drivers or whether it can also interrogate system BIOSes and subsystems.

Software distribution can save valuable time a manager would otherwise spend walking from client to client and doing manual installations. We look for powerful, easy-to-use scripting capabilities and flexible tools that distribute software and updates to both clients and multiple servers. We consider whether the distribution can be configured to occur when the user logs on, at a specified date and time, or at the user's or manager's request. Undo or recovery functions are a plus. We give additional weight to utilities that can collect configuration files for modification and allow users to opt not to accept an upgrade. Deletion of older software and retention of network security are supplementary benefits for the network administrator. We also consider whether the distribution information is shared with the software inventory and application metering modules.

Application-metering utilities should provide an array of options for enforcing limits on application licenses. We want to be able to monitor all applications on clients and on multiple servers, as well as assign privileges and restrictions based on users or groups. Notification when a license is exceeded is a desirable feature. Queuing waiting users and being able to display application utilization by user are also taken into account. Strong reporting capabilities are needed for planning accurate software purchases. The ability to meter suite licenses in particular influenced our ratings.

Network traffic statistics can be monitored by the NOS, but we expect more when that function is part of a management suite. We consider the level of detail the package provides, such as the ability to isolate traffic generated per client. Most important is the ability to generate alerts when anomalous activity occurs.

Server monitoring capabilities are usually part of your network operating system. We want tools that add value to the basics already there. We look at the integration with the suite's notification system to send alerts for critical server events, and we especially like packages that allow thresholds to be set up and trigger events to ensure maximum up time. CPU, memory, disk, and volume usage need to be captured both in real time and historically and presented through informative graphic displays. Security breaches or changes should be monitored as well.

Remote control needs to take place both locally and also across wide-area links. We look for access across the LAN and via modem. We want the ability to take over a client machine entirely, transfer files, and chat with the user. The effective remote network manager should be able to view files (such as a client's CONFIG.SYS) without taking complete control and, if necessary, initiate a remote reboot.

Virus protection should be performed on the server as well as the client. Scheduling options are needed for clients, and the server should never be allowed to accept a file without first checking for viruses. Messaging features should minimize the spreading and impact of viruses that are discovered. Standard virus protection procedures of cleaning, deleting, or renaming infected files are considered. We expect tools that let you easily update the virus dictionary or, even better, automatically from the vendor's BBS.

Integration among these tools must extend beyond merely bundling applications together or a common toolbar and interface. Suites should share the database, notification, and reporting tools among modules in an accessible format. We also like modules that are aware of the other installed components and can trigger functions, especially for notification or logging certain network events. Integration with add-on or third-party software and hardware products is a bonus but not essential.

SUITABILITY TO TASK	
Product name	
HW and SW inventory	Poor
Software distribution	Fair
Application metering	Good
Server monitoring	Excellent
Network traffic statistics	Poor
Remote-control features	Fair
Virus protection	Good
Integration	Excellent

Microsoft Systems Management Server (SMS) and Novell's ManageWise—two products that don't fit our filter exactly but are of considerable importance nonetheless. They both provide a framework that allows other products to work intimately with Windows NT Server and NetWare, respectively.

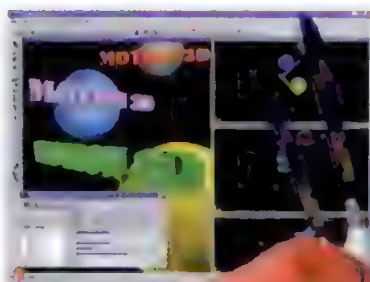
Novell's ManageWise is an unusual combination of NetWare Management System, a version of Intel LANDesk Management Suite (1.51) earlier than the one we review here, a network packet analyzer, and an SNMP (Simple Network Management Protocol) Manager, which monitors enterprise-wide net-

work devices like bridges and routers.

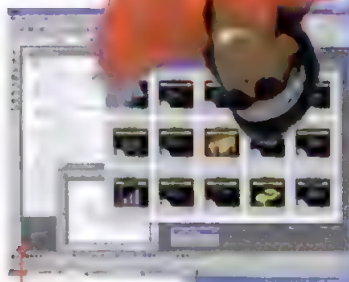
Microsoft SMS is a multisite desktop systems management package offering powerful client inventory, diagnostics, traffic monitoring, and software distribution features, but while it can work with several NOSs it requires Windows NT Server to run.

COREL DRAW! 6

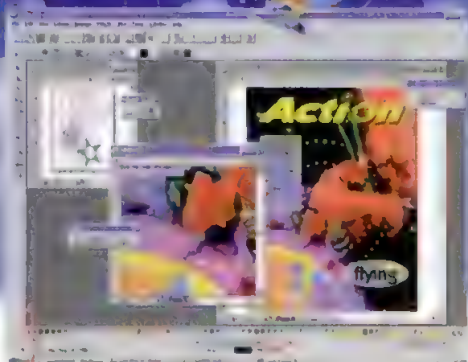
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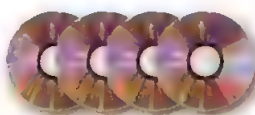


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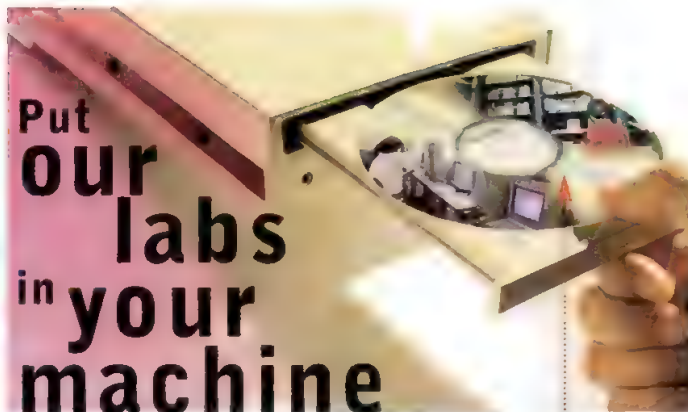
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NETWORKING

Network Management Suites

For those whose needs are less comprehensive, we offer a Buyer's Guide of which lists products that provide only one of the functions found in suites. You'll find information on server-monitoring tools, virus-scanning utilities, and application-metering software.

AND THE WINNER IS...

In the end it was difficult to decide on a winner. Each product had its strengths and weaknesses and proved suited to its own particular network environment. LANDesk Management Suite 2.01, our Editors' Choice, offers an excellent solution for small- to medium-size NetWare networks and plugs into Novell's NMS for

Suites have different features to target different types of networks, but each performs at least inventory, software distribution, and application metering.

larger networks. The Frye Utilities for Networks, our Editors' Choice for the past two years, is also powerful and lets you add modules as you grow. However, it's the most expensive package reviewed. It was also the only package that still has a DOS-based interface.

Of the products we tested in our roundup, The Norton Administrator for Networks is a good choice for multi-NOS enterprise networks, but you should also consider Novell's ManageWise, particularly if you use NetWare on a large network and need to keep track of all of your hubs, routers, and other enterprise components. If your network is largely based on Windows NT Server, take a good look at Microsoft SMS. BrightWorks is a decent solution for NetWare LANs that require the features it offers.

MANAGEMENT CONFUSION

One of our principal findings was that the network management suite market is dif-

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Network Management Tools Compared

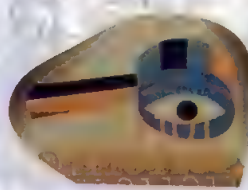
The network management suites we review in this feature represent one category in a whole spectrum of available management tools.



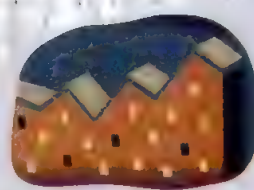
NOS management tools



Wiring-hub reporting tools



Protocol analyzers



Individual network management programs

What are they?	Utilities that come as part of network operating systems.	Hub microprocessors and software.	Software packages or specialized workstations.	Software packages that offer one or two management functions.
What devices do they manage?	Desktop systems, servers, printers.	Hubs, cabling, network interface cards.	Hubs, cabling, network interface cards, routers, bridges.	Desktop systems, servers, cabling, software.
What functions do they offer?	Traffic statistics, usage auditing, event alerts, server and client control, printer control, user-rights control, hardware inventory, memory and hard disk monitoring. (Functions vary depending on the NOS.)	They measure the number and quality of packets each node sends across the network.	They capture and decode packets moving across the network.	One or two of the following: hardware and software inventory, application metering, software distribution, virus scanning, server monitoring, network traffic statistics, troubleshooting, and client control.
Do they manage LANs or WANs?	Can be either, depending on the NOS.	LANs.	Either.	They focus on LAN elements but can cross WANs to manage multiple servers.
Why are they useful?	They give a manager rudimentary tools for diagnosing problems, gathering information on devices, and controlling certain devices.	They help a manager detect and troubleshoot traffic problems.	They can diagnose traffic problems better than management packages and hub tools.	They let a manager collect, analyze, and report on hardware, software, and traffic information from a single location.

difficult to define. The products we reviewed are fairly different from one another in terms of intended market, features offered, and even in the way that features are implemented.

Only one of the packages we reviewed, LANdesk Management Suite, our Editors' Choice, offered all seven of the features we were looking for in the main package. The Frye Utilities for Networks came in second with five, and The Norton Administrator for Networks had just three, though it provides popular add-ons for virus protection and remote control. All of the packages had inventory, software distribution, and application-metering features.

Furthermore, while four of five packages were targeted toward the LAN manager, The Norton Administrator for Networks clearly targets the enterprise network. It is virtually protocol independent and can congregate information from distributed sites.

The Frye Utilities for Networks and Saber LAN Workstation also have some multi-NOS capabilities, but BrightWorks and LANdesk Management Suite are meant for NetWare-only LAN environments. LANdesk, The Norton Administrator for Networks, and Saber LAN Workstation support NetWare Directory Services (NDS), which provides a single point of management for distrib-

uted network resources.

Novell's ManageWise and Microsoft SMS, covered in separate sidebars, are also targeted at multisite enterprise networks. ManageWise even includes SNMP management capabilities. To get a better idea of how the packages we reviewed fit into the spectrum of LAN and WAN management possibilities, see "Network Management Options Compared." Keep in mind, however, that the lines between categories have blurred—a trend that is likely to continue.

There are also considerable differences in the way the modules work. BrightWorks, for example, runs a series of NLMs on your NetWare file server; these NLMs gather information and dis-

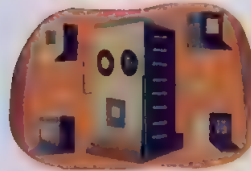
Network Management Suites



Network management suites



WAN management systems



System management products

Software suites that combine several functions usually found in individual management packages. There's usually some sort of integration among the modules.

Desktop systems, servers, cabling, software.

Hardware and software inventory, application metering, software distribution, virus scanning, server monitoring, network-traffic statistics, troubleshooting, and client control.

They focus on LAN elements but can cross WANs to manage multiple servers.

They let a manager collect, analyze, and report on hardware, software, and traffic information from a single location.

Systems that employ a distributed architecture using agents in WAN devices to gather information on traffic and performance.

Wiring hubs, routers, servers, printers, bridges

Network-device monitoring and remote control using SNMP, CMIP, or IBM's SystemView architecture.

WANs.

They help a manager remotely control and gather data on widespread network devices.

Systems that employ a distributed architecture originally focused on mainframes. This architecture evaluates the performance of programs, subsystems, and communications links.

Elements of mainframe systems, applications, WAN and LAN devices.

Statistical reporting, auditing, and control.

Elements of both.

They report emergency conditions and help managers both uncover bottlenecks and project needs for improved software and equipment.

tribute and meter applications. McAfee's Saber LAN Workstation relies on TSRs or client-based agents to perform the same tasks. Both Microsoft SMS and ManageWise are tightly integrated programs that work as extensions of the operating system; hence they can gather in-depth information without having to run a TSR or driver on the server.

All of the products claim to offer integration among the modules, but they base that claim on different characteristics. Ideally a suite should let you launch all modules from a single screen, and each of the modules' menus and dialog boxes should share a common look and organization. Modules should also be able to

share data to create integrated reports and to trigger alerts and other functions among them.

Intel's LANdesk Management Suite, for example, was the best integrated of the products we tested. It featured a unique object-based interface: Choose an object, such as a server, from an object tree and LANdesk presents a menu of relevant management options. We would have liked the software inventory and metering modules to have the ability to share data, however.

WHAT WORKED

Fortunately, we found that all of the products installed and worked as advertised,

sometimes with a little help from technical support. The Norton Administrator for Networks was a snap to install, as were The Frye Utilities for Networks and LANdesk Management Suite. Both BrightWorks and Saber LAN Workstation, however, required some extra work and manual editing of our server and client configuration files.

Report generating and event notification were areas that we watched closely. LANdesk Management Suite has a powerful visual report writer that guides the user through the report-generating process, and all of its modules can send alerts to a centralized Alert Management System (AMS). The Norton Administrator for Networks also has a versatile report generator, but it has no notification capabilities.

BrightWorks uses a third-party report generator, Crystal Reports, which is now produced by Seagate Software. Crystal Reports does a good job of integrating data from different modules and offers versatile alerting capabilities. The Frye Utilities for Networks has extensive report capabilities, though the reports are not as graphical as in the Windows-based packages. Its NetWare Early Warning System was powerful and well integrated with all the Frye modules.

WHAT THE FUTURE HOLDS

In 1992, Intel, Microsoft, and Novell organized the Desktop Management Task Force to develop the Desktop Management Interface (DMI) standard for identifying desktop computer resources. Microsoft went a step further in tracking desktop resources and pushed the Plug and Play standard in Windows NT and Windows 95.

The DMI architecture creates a database within a desktop computer called a Management Information File (MIF). At boot up or at a specific time, such as docking and undocking a laptop, the DMI-compliant elements in a PC create a MIF that identifies each functional element of the desktop machine, from the BIOS and video card to each application.

Unfortunately the DMI MIF standard is still a work in progress. The committee is trying to create a standard for

Evaluation Test-Bed: Network Management

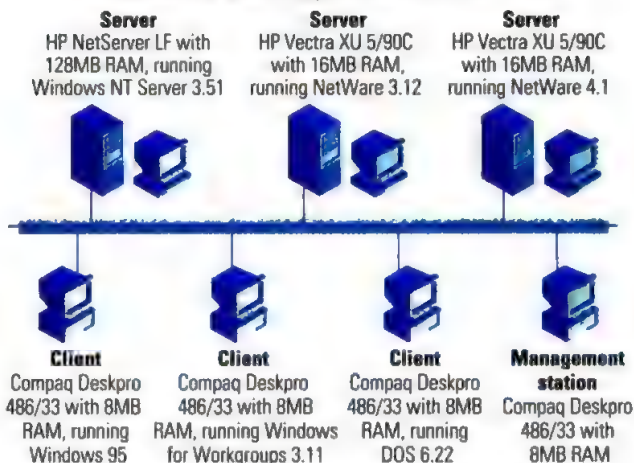
As dependence on the network grows, the network manager must guarantee his users around-the-clock reliability, asset control, optimum performance, and instant problem resolution.

To evaluate the network management packages in this review, we targeted seven areas typical of day-to-day network management: hardware and software inventory, software distribution, application metering, server monitoring, network traffic statistics, remote client control, and virus protection. To qualify as a suite solution, the software needed to supply four of these functions. We tested each suite's services and noted any additional add-on products the vendor offered. We also assessed the integration of the user interface and databases.

Our filter required that the product work with a NetWare 3.12 file server. Typically, however, corporate environments have multiple servers with a variety of operating systems and different client types. We included two additional NOSs in our test-bed, NetWare 4.1 and Microsoft Windows NT Server 3.51; in addition to DOS and Windows for Workgroups clients, we set up a Windows 95 client.

The 10Base-T Ethernet test network was set up in a star configuration. The software suites were loaded first on the NetWare 3.12 server, then on NetWare 4.1. Both versions of NetWare were running on HP Vectra 5/90C servers with 3Com 3C509 ISA network adapters. If the product could support Windows NT, it was installed on our NT server

Network Management Test-Bed



running on an HP NetServer LF with a Novell/Eagle NE3200 EISA adapter.

Our client PCs were Compaq DeskPro 486/33s running Microsoft Windows for Workgroups 3.11, MS-DOS 6.22, and Windows 95. They were configured with ISA Novell-Eagle NE2000 and 3Com 3C509 adapters using Novell's VLM 1.2 drivers. The management platform ran either DOS or Windows on another Compaq DeskPro.

Each vendor was asked to submit network operating system updates for its products to ensure use of compatible NetWare Loadable Modules (NLMs) and system files. During installation we considered automated or manual procedures for setup and configuration. In testing each software module, we examined alerting capabilities and reporting of historical and real-time data.—Jeffrey G. Witt

many types of computers, operating systems, and operational scenarios, and the final specification continues to be delayed. Two packages in this roundup—Intel LANdesk Management Suite and Microsoft SMS—are capable of generating and using DMI information.

The Plug and Play feature of Windows 95 creates its own registry of objects, a database of a PC's resources, in .INF files. This .INF registry contains almost all of the information called for in the MIF, so thanks to Plug and Play, many companies in the PC business will be able to implement DMI-compliant resource management as soon as the committee defines it. All of the packages here can work with Windows 95, but so far none of them can make use of the .INF registry information.

In the meantime you can expect network management suites to continue to grow in power and features.

McAfee Inc.

BrightWorks

BrightWorks is a good solution for managers of NetWare-only LANs who need strong software distribution, application metering, and hardware and software inventory tools. However, network traffic monitoring is not part of the package, and remote control and virus protection are sold separately as add-ons.

If you manage a large network, you will like BrightWorks' LAN Support Center (LSC) help-desk module. Every time you fix a problem on your network, you can add the solution to the module and it becomes part of the help-desk database. LSC lets you search through help-desk calls quickly to find an answer to your problem.

BrightWorks does a fair job of integrating its modules into a suite with a common look and feel. Like all the packages reviewed here, it lets you launch all of its modules from a single menu. You don't get a common database for data, but all of the modules can share information among their data files. In future releases,

McAfee is planning to switch to a common, integrated FoxPro database.

TRY BEFORE YOU BUY

McAfee is the only vendor in this roundup that lets you try its utilities free, downloadable from McAfee's BBS or FTP site. You can then register and receive technical support ranging from \$600 for 5 users to \$37,250 for 2,500. McAfee also offers an optional remote control (Net-Remote) and virus scanner (NetShield), which integrate

SUITABILITY TO TASK

BrightWorks	
HW and SW inventory	Good
Software distribution	Fair
Application metering	Good
Server monitoring	Good
Network traffic statistics	N/A
Remote-control features	N/A
Virus protection	N/A
Integration	Fair

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Network Management Suites

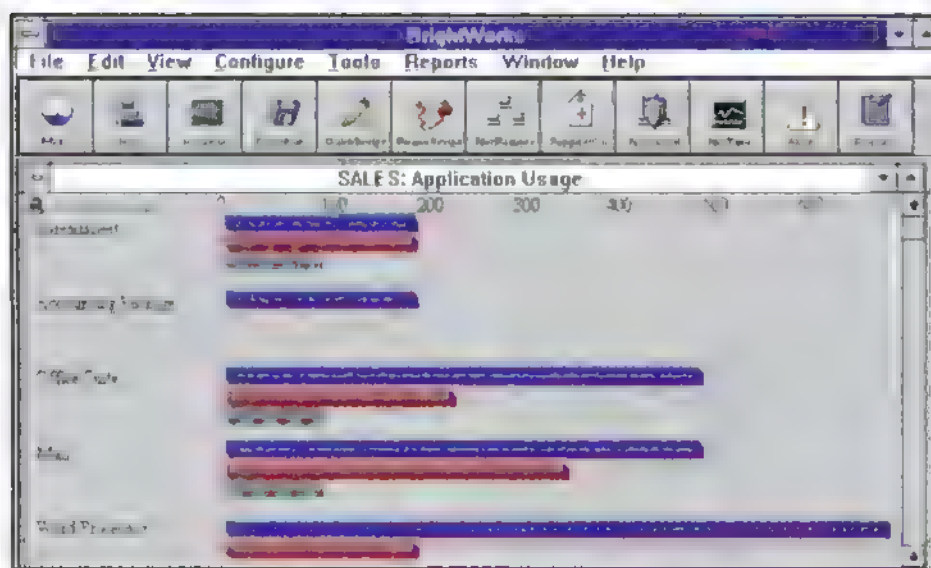
into the BrightWorks menu.

BrightWorks runs as a group of NetWare Loadable Modules (NLMs) on NetWare 3.x and 4.x servers. As an NLM solution, it works only with NetWare servers. It runs on NetWare 4.x only in Bindery emulation with no hooks to NetWare Directory Services (NDS), which makes it an unlikely option for monitoring multiple servers and large numbers of clients across a WAN.

However, the utilities can work across multiple NetWare 3.12 servers.

Installation is straightforward, but you must know how to edit clients' log-on scripts and AUTOEXEC.BAT files, and you must have current NetWare drivers and NLMs. BrightWorks includes the necessary updated files on the installation CD. We encountered a problem because we used an incompatible version of the C-library (CLIB) NLM on our NetWare 3.12 server; after we copied the CLIB NLM included with BrightWorks, everything worked fine.

In addition to the seven NLMs that you have to load on your file server (plus an



BrightWorks' SiteMeter can monitor application usage on multiple NetWare servers.

viewed, BrightWorks can gather standard information about client hardware. It supports Compaq's Intelligent Manageability (IM), which is similar to the Desktop Management Interface (DMI). McAfee plans to support DMI as well as SNMP in the next version. Although we had no problems metering Windows 95 clients, software compatibility notes from Microsoft indicate possible problems using Windows 95 as the management station. BrightWorks' flexible software inventory database has hundreds of software titles; if it finds an application it doesn't recognize it lets you add the information.

BRIGHTER TOOLS

Crystal Reports, the report generator in BrightWorks, lets you generate customized reports based on information from several different modules. For example, you can create both a text and graphical report of all software usage, hardware specs, and software versions. You can also export these reports in such common formats as ASCII, dBASE, and comma-delimited files.

One of our favorite features in the BrightWorks management suite is HawkNet's NetTune, a bundled server monitor and tuning utility. NetTune can automatically monitor almost all of NetWare's configurable settings. If it finds a problem, its SmartTune feature will prompt you to make a change and then do it for you if you accept its recommendation. Unlike Frye's FUN, NetTune can monitor network statistics between multiple servers, but it doesn't provide traffic statistics for the general network.

The SiteMeter utility is one of the most powerful in this roundup for server-based

application metering. In addition to controlling access to all of the applications on your NetWare file servers, it lets you share licenses across multiple servers (over both IPX and TCP/IP protocols). The only other product here that offers this feature is Saber LAN Workstation. But while you can meter and control access to NetWare server-based applications for DOS, Windows, Macintosh, and OS/2 clients, you cannot meter software on client hard disks.

Similar to Saber LAN Workstation and Frye's FUN, BrightWorks relies on a scripting language to distribute software. In addition to BrightWorks' standard QuickScript language, McAfee also includes an easy-to-use PowerScript utility. If you have ever used Visual Basic, you will probably feel comfortable with PowerScript. If you are not familiar with different scripting languages, McAfee includes several sample scripts that you can use to set up software distribution jobs.

BrightWorks' notification and alerting utility is integrated with the hardware and software inventory and application metering modules. You can set up BrightWorks to send an alert regarding configuration changes via cc:Mail, MHS, e-mail, and pager. If a user attempts to make hardware or software changes, BrightWorks will automatically send an alert to the network administrator—an important feature if you're sensitive to network security.—Steve Rigney

Frye Computer Systems Inc.

The Frye Utilities for Networks

As standalone products, The Frye Utilities for Networks (FUN) offer superlative features. When installed together, Frye's modules form a tightly integrated suite capable of managing every detail of your LAN. Unfortunately, FUN remains tied to a DOS interface, and its modules, while very powerful, can add up to a more expensive package than the other products reviewed here.

FUN offers hardware and software inventory, application metering, software distribution, server monitoring, traffic statistics, NetWare console management, and an alert manager. The modules are sold separately and can be installed in any com-

FACT FILE

BrightWorks 2.1

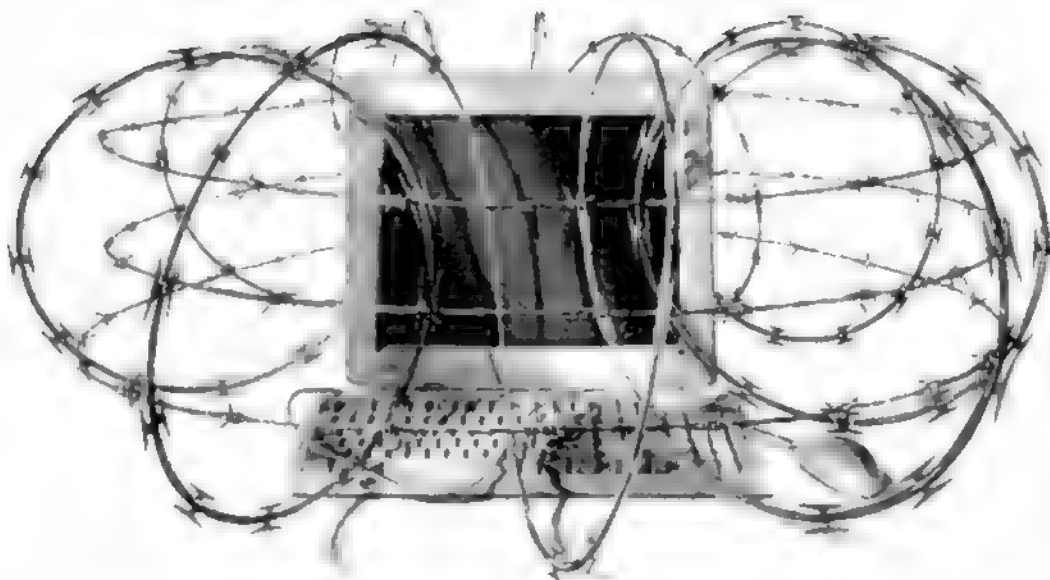
List price: 10 nodes, \$600; 1,000 nodes, \$26,800. **In short:** BrightWorks is best suited for NetWare-only LANs, providing a solid group of modules for software distribution, hardware and software inventory, application metering, and help-desk features. Integration among the modules is fair, and add-on products plug right into the interface. Remote client-control and virus-scanning modules are optional. BrightWorks includes a good server monitor and one of the best server-based application metering utilities, although the suite does not let you meter applications on client hard disks.

McAfee Inc., 2710 Walsh Ave., #200, Santa Clara, CA 95051-0963; 800-866-6585, 408-988-3832; fax, 408-970-9727; e-mail, support@mcafee.com; Web, http://www.mcafee.com

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optional NLM for server monitoring). BrightWorks relies on a client-based Btrieve requester TSR and other command-line utilities to gather desktop information. When BrightWorks moves to a FoxPro database, you will not have to load the Btrieve requester on your client PCs.

Like most of the other products re-



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Microsoft's Enterprise Entry

By Todd Columb

Microsoft Systems Management Server 1.1 (SMS) is an excellent choice for Windows NT-based, multisite networks. We did not include SMS in our main review because it did not perform four of our seven management tasks. And while SMS works with multiple NOSs, it runs on Windows NT Server, not NetWare.

SMS, part of Microsoft's BackOffice suite, offers a good mix of client inventory, diagnostics, and traffic monitoring, along with an excellent software distribution module. But SMS does not include some important LAN management functions, such as application metering and virus checking.

Although all the modules are capable of operating over a variety of network operating systems, you must install SMS on Windows NT Server. Installation on our NT server from the CD was a breeze.

SMS clearly prompts you for all administrative choices and even automates the sometimes awkward task of creating the SQL databases.

Windows NT Server or Workstation is required to run SMS, as is Microsoft SQL Server—and currently, each must be purchased separately. All required components (NT Server, SQL Server, and SMS) can be installed on one server or on multiple servers at the same control site.

TIED TOGETHER

With deep roots in Windows NT, SMS 1.1 components take full advantage of the powerful GUI environment. Innovative use of drag-and-drop features make it extremely easy to navigate the desktop. You can use drag-and-drop to create a software distribution job of a predefined package just by dropping it on a distribution server.

The tight integration between all the functions of SMS is apparent when browsing through the sites directory.

Like Novell's ManageWise, SMS will not recognize a computer or let it appear in the site tree unless it has been inventoried.

Similar to Symantec's Norton Administrator for Networks, SMS lets you manage your network in a definable, hierarchical view. Integrating well with NT networks, SMS recog-

other vendors.

For hardware inventory, SMS creates and forwards a Management Information File (MIF) as specified by the Desktop Management Interface (DMI) from each client to the central site server's database. SMS also can track custom inventory information from a client computer using the included MIF

Generator program. Several other useful utilities are included with SMS, such as one that reads information from servers running Compaq's Insight Manager.

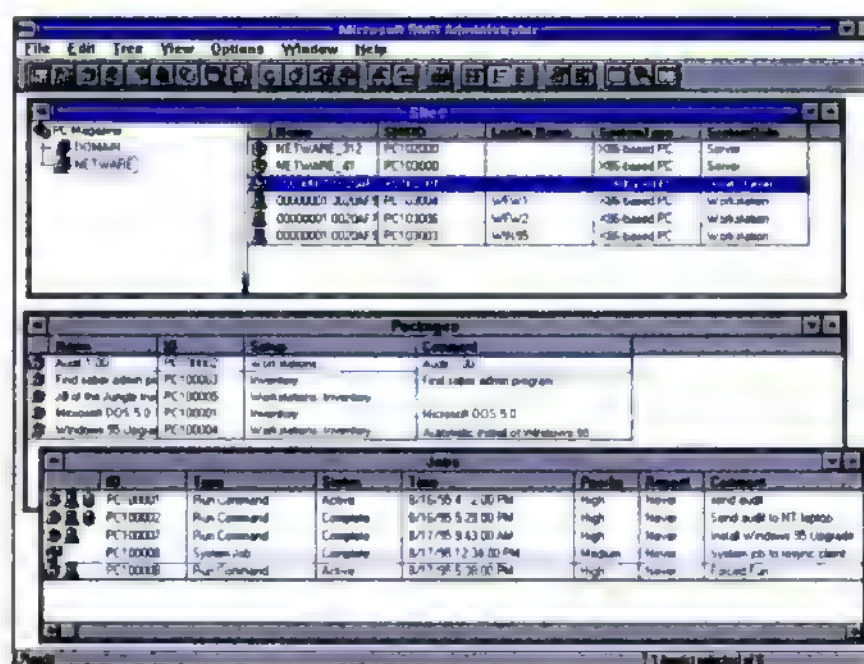
SMS doesn't skimp on reporting. It includes a custom version of the robust Crystal Reports, which you must install separately. A dozen predefined reports provide lists such as which client PCs can upgrade to Windows 95 based on memory, processor, and disk space specifications.

The updated Help Desk and Diagnostics functions allow administrators to remotely diag-

nose or control DOS, Windows 3.x, and Windows 95 clients. New support for NT's Windows Internet Name Service (WINS) lets you remotely control a client over a TCP/IP WAN.

SMS offers excellent software distribution across an enterprise network with integrated inventory, remote control, and network traffic monitoring. But it's not intended for everyone: For application metering, virus checking, or NetWare server monitoring, you'll want to consider products in our main roundup. Because it requires Windows NT and SQL Server, SMS is best suited for Windows NT networks. **Microsoft Systems Management Server, Version 1.1.** Estimated street price: \$649 per server, \$54.95 per client up to 20 clients, \$34.95 per client for more than 20 clients. **Microsoft Windows NT 3.51.** 10 clients, \$699. **Microsoft SQL Server,** \$999. Microsoft Corp., One Microsoft Way, Redmond, WA 98052-6399; 800-426-9400, 206-882-8080.

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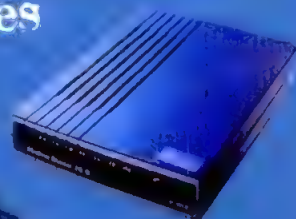
SMS lets you manage your network in a definable, hierarchical view—helpful with several network sites.

nizes existing NT domains, which are groupings of servers and network resources. For NetWare servers, SMS can create a special domain or multiple domains that contain the servers.

From the central-site SMS server, you can distribute software to any PC over a WAN. You can even control WAN bandwidth utilized for software distribution to avoid bringing a busy network to its knees. In addition, Microsoft plans to provide free step-by-step documentation and tools for using SMS to deploy Windows 95 soon.

SMS handles software inventory differently from the other suites reviewed here. The inventory audit is sent as a software distribution job. From these instructions, the SMS module on the client performs software inventory, then sends the data back to the servers just as it sends the hardware inventory data. The application database lists more than 2,500 Microsoft applications; you will need to add information for software from

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Network Management Suites

bination. The Frye IntroPack (\$1,195) includes three basic modules: server monitoring, alerting, and inventory. Other modules vary in price from \$249 to \$1,495 each. A full-featured configuration can cost more than \$6,000 for 50 nodes, the most expensive solution we reviewed.

Recently acquired by Seagate, Frye Computer Systems has introduced a new management suite for Windows called The Frye Network Management Platform. The suite's first programs, which include WinLAND for inventory and StatRack for network and server statistics, look promising. We did not review them here because they do not meet our review criteria, and they do not interoperate with FUN's DOS-based modules.

THE FUN BUNCH

FUN's software-metering module works with several operating systems including NetWare, Windows NT Server, and VINES. The rest of FUN's modules,

SUITABILITY TO TASK

The Frye Utilities for Networks

HW and SW inventory	Excellent
Software distribution	Excellent
Application metering	Good
Server monitoring	Good
Network traffic statistics	Good
Remote control features	N/A
Virus protection	N/A
Integration	Good

however, work only in a NetWare environment. With NetWare 4.x, Bindery emulation must be enabled for FUN to work properly; FUN does not support Novell Directory Services (NDS). On our NetWare 4.1 server, we had to create a supervisor-equivalent account using the NetWare 3.x SYSCON utility to install several of the modules.

As you install FUN modules, they autodetect other FUN modules already installed and plug themselves into a main menu. From this DOS-based menu system, you can access all of FUN's modules, which share data via a common database.

Frye's NetWare Management is the cornerstone of the FUN suite. It improves on NetWare's Monitor, providing real-time statistics for the server, NLMs, drivers, and client connections. Statistics can be viewed on-screen or in useful reports. The reports are extensive but are not as graphical or customizable as the reporting found in LANDesk, BrightWorks, or The Norton Administrator for Networks.

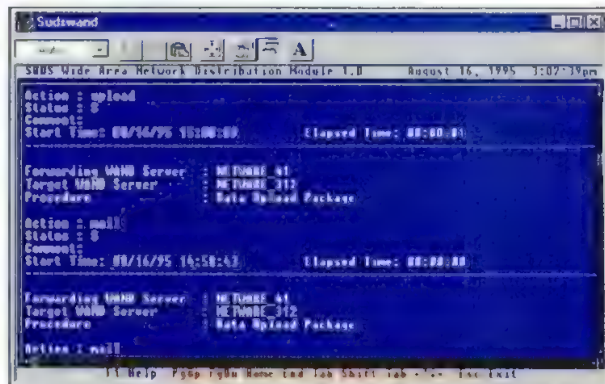
The Node Tracker captures network node traffic and error information, including IPX/SPX and shell data. The only other package to offer network traffic statistics, LANDesk, provides a more intuitive interface, while Frye's Node Tracker provides more extensive features, such as bridge statistics and a handy point-to-point communications test between any two nodes on the LAN.

The detailed hardware and software inventory collected by the LAN Directory (LAND) module has a slight edge over the other products in this review in breadth of information, tracking details such as modification dates of configuration files, and recognizing more than 6,000 software titles. But accessing information through its DOS interface is not as easy as with GUI-based products.

MEDLEY OF MODULES

Frye offers software distribution in three flavors: single server, WAN distribution, or server-to-server. The single-server Software Update and Distribution Service (SUDS) is not quite as elegant as LANDesk's snapshot feature. SUDS lets you define standard configuration files (such as CONFIG.SYS and WIN.INI), create directories, and remove or copy files on client PCs. Wide-Area SUDS (SUDSWAND) lets you distribute SUDS jobs to other servers on the WAN.

Similar to NAN's Site Manager, Frye's SUDS Server Update Program for NetWare (SUDSSRV) allows you to update files directly on NetWare servers (such as NLMs). Unlike NAN, however, SUDSSRV lets you schedule and execute console commands to load or unload NLMs on



Frye's SUDSWAND module lets you specify servers to distribute software across a WAN.

the remote server as part of the distribution job.

The Software Metering and Resource Tracking (SMART) module provides good server- and client-based application metering. SMART is NLM-based and meters applications on NetWare servers; to meter DOS and Windows applications on client hard disks, you must load a 4K TSR on each client. SMART did not work properly with Windows 95 clients; Frye says an upgrade will be available by the time you read this.

Closely tied to all the modules is the NetWare Early Warning System (NEWS), one of the best-integrated alerting utilities we saw (although each notification option is sold separately for \$295 or more). NEWS alerts can capture and redirect messages from other modules and also trigger events. For instance, when a server

FACT FILE

The Frye Utilities for Networks

List price: NetWare Management, \$495 (one server), \$395 per additional server. NetWare Early Warning System, \$495 (one server), \$395 per additional server; pager option, \$295; cc:Mail module, \$295, Microsoft Mail module, \$295; fax option, \$395. NetWare Console Commander, \$395 per server. SUDSWAND, \$1,495 (two servers); \$1,295 per additional server. SMART, \$495 (100 nodes). SUDSSRV, \$595 (two servers); \$395 per additional server. LAN Directory, \$495 (50 nodes). SUDS, \$995 (50 nodes). Node Tracker, \$249 (50 nodes). AIM, \$895 per NMS installation. MACSUDS, \$995 (50 nodes). **In short:** The Frye Utilities for Networks are feature-rich network management modules that can be installed independently or combined into a tightly integrated suite—although the individually priced modules can add up to be very expensive. Even though it makes DOS extraordinarily usable, FUN isn't as easy to use as the Windows-based products we reviewed. FUN's strong showing in all management areas except remote control and virus protection make it worth considering, especially if you prefer a DOS-only environment.

Frye Computer Systems Inc., 31 St. James, #200, Boston, MA 02116, 800-234-3793, 617-451-5400, fax, 617-451-6711; e-mail, mail@frye-bos.mhs.compu-serve.com

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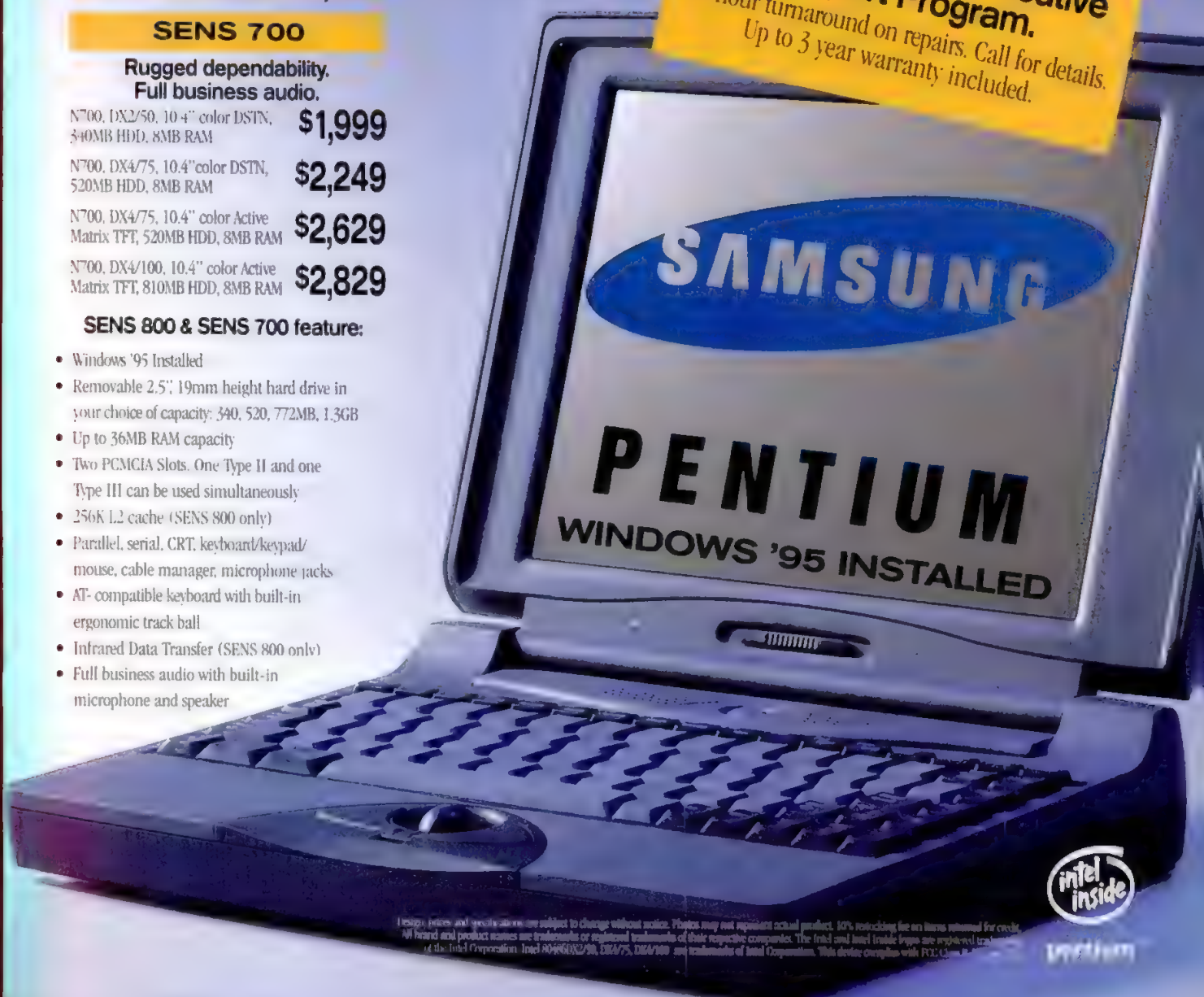


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pentium

cache buffer threshold is exceeded, NEWS can call the NetWare Console Commander module and force one or more NLMs to unload to free up server RAM.

FUN continues to be a strong network management player primarily because of the completeness of its modules, but its DOS-based interface needs to be revamped. The new Windows-based Frye Network Management Platform has potential but is far from being a complete suite.—Gregory C. Alwang

Intel Corp.

LANdesk Management Suite



We found LANdesk Management Suite 2.01 to be the most full-featured package for NetWare networks in our roundup. Its unique software distribution method makes the task fast and easy. LANdesk also was the only

package in the review group to include virus protection, and it rounds out the suite with a superb custom report generator, good hardware and software inventory functions, satisfactory application metering, and extensive server monitoring.

This new version, which works with NetWare only, includes full support for Novell Management Services and NetWare Directory Services (NDS). While LANdesk is not fully compatible with Windows 95 clients, Intel promises an

Novell's ManageWise: Beyond the Desktop

By Robert L. Morrison

More than a basic network management tool, Novell's ManageWise 1.0 is designed for multiserver NetWare environments where the need to control non-PC network devices is key. ManageWise met our filter in terms of features, but we decided to review the product in a sidebar because these features come from Intel's LANdesk Manager 1.51, an earlier version of LANdesk Management Suite 2.0, which we review separately in this roundup. To upgrade, registered users of ManageWise can purchase LANdesk 2.0 for half-price.

ManageWise combines Novell's LANalyzer 1.0 and Intel's Virus Protect 2.1 with the LAN management tools of LANdesk 1.51 and the messaging of Novell's NetWare Management System 2.0 (NMS). The result is a tightly integrated platform with powerful wide-area management capabilities that set it apart from most other products.

What also makes ManageWise unique is that it allows other management products to plug into its framework. Novell provides a 120-page guide listing NMS 2.0-compatible products such as help desk automation and database server monitoring. What would make ManageWise complete are software distribution and metering tools—available in the newest version of LANdesk—and support for Windows 95 and Windows NT Server.

MAP THE NET

One of the most outstanding features of ManageWise is the NetExplorer tool.

NetExplorer automatically detects network devices and displays them in the form of a segment, internetwork, or location map. These maps provide the interface to the rest of ManageWise's tools. Depending on the type of node selected (indicated by different icons), NetExplorer will launch the appropriate management program. However,

connected to the network by source-routing bridges. You must manually add these devices after the discovery process is complete.

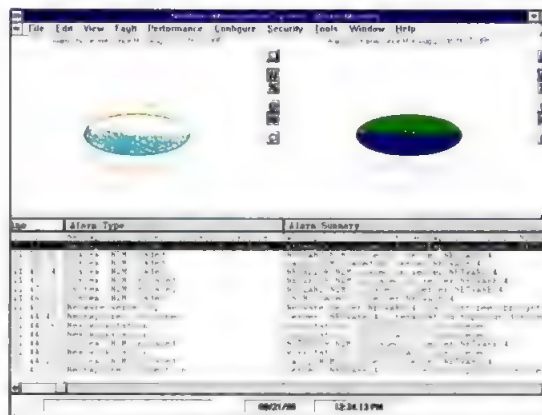
Unlike any of the products in the review group, ManageWise lets you manage common Simple Network Management Protocol (SNMP) and Hub Management Interface (HMI) nodes

such as modems, CSU/DSUs, routers, hubs, print servers, and UPSs. It can even communicate with some PBXs and HVAC (heating, ventilation, and air conditioning) systems. ManageWise comes with more than 400 built-in alarms and lets you add new SNMP devices to the system.

ManageWise's Alarm Monitor shows the types of alerts and their frequency in an easy-to-read display. The graph lets you know whether a severe event warranting further investigation has occurred.

Alarm Monitor cannot send alerts via e-mail or pager, but third-party alerting products are available.

Novell's LANalyzer can analyze network traffic down to the packet level. The system supports a wide variety of protocols including IPX/SPX, TCP/IP, and AppleTalk. On our test network, we were able to trace a NetWare 4.1 Service Advertisement Protocol (SAP) and each NetWare 3.12 server's response. The ability to view actual packet data is very helpful in troubleshooting network problems.



The ManageWise alarm manager lets you see the number of alarms and their severity at a glance.

there's a high price to pay: The NetExplorer NLMs require a minimum of 10MB RAM on each server.

NetExplorer begins the discovery process by scanning the network for IP nodes such as routers and bridges, then checks for IPX devices, such as NetWare servers and clients. Next, LANalyzer scans the network to identify any other devices by MAC address.

The process is not foolproof, though: It will not identify ARCnet clients, SFT III servers, routers using multiple MAC addresses, or Token Ring segments

Network Management Suites

update by the end of the year.

LANDesk has new node-based licensing starting at \$595 for five nodes—a good value for the features included. LANDesk 2.01 is also half-price for registered users of Novell's ManageWise 1.0 (see the sidebar "Novell's ManageWise: Beyond the Desktop").

LANDesk 2.01's easy-to-use, customizable interface resembles NetWare 4.1's NWADMIN and its object tree structure. Simply select an object, such as a server,

Intel's Virus Protect, bundled with ManageWise, is excellent. The system checks files in real time and generates SNMP alerts if it finds a virus. The scanner can be configured to skip or include certain types of files as well as perform scheduled scans. Clients can be configured to check for viruses when they log in or at start-up.

ManageWise uses LANDesk to capture inventory information about DOS, Windows, and Macintosh clients when users log onto the network. Inventory changes on NetWare file servers or clients result in an SNMP alert and are handled by the alarm manager. Finding and viewing inventory information is very easy and complete. Unfortunately, the built-in printed reports are not very attractive or customizable, but the data can be exported in ASCII format or via a DDE link to other Windows applications.

Novell has taken a unique approach to network management by incorporating several proven products into an integrated, NMS-based environment. ManageWise is a feature-rich offering, loaded with powerful server and traffic monitoring, SNMP and non-PC device support, and a strong antivirus module. It lacks application metering and software distribution but has the flexibility to accommodate third-party products. **ManageWise 1.0.** List price: five nodes, \$795; 1,000 nodes, \$12,995. Novell Inc., 2180 Fortune Dr., San Jose, CA 95131; 800-638-9273, 408-434-2300; Web, <http://www.novell.com>.

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from the tree and a menu of appropriate management options appears. Installation was a snap, considerably easier than previous versions: After running an install utility on the management console and making some minor changes to client log-on scripts, you're up and running. Intel's documentation was comprehensive, covering installation, troubleshooting, and usage tips.

QUICK AND EASY

A truly unique feature in LANDesk is its method of software distribution. First, LANDesk records a profile of the PC from which you will distribute the software. After you install the software and make configuration changes, LANDesk takes another snapshot of the PC and builds the distribution job based on what you've added or changed. This snapshot feature eliminates the need to learn a scripting language.

LANDesk's powerful visual report writer was one of the most flexible in this roundup. To ease the reporting process, LANDesk's wizard-like feature guides users through selecting the fields, sort order, and totals for a report. All of the management tools can export information directly to the report writer.

Similarly, all of the LANDesk modules send alerts to a new centralized Alert Management System (AMS), an improvement over previous versions. Like Frye's FUN, LANDesk now lets you automatically execute a predefined task in response to an alert. Notification methods include SNMP traps and e-mail messages.

Setting up software metering, on the other hand, can be time consuming, because LANDesk cannot import data from the inventory database. In addition to the product name, LANDesk prompts you with dialog boxes for the application's location, the number of licenses owned, and any access restrictions. The software-metering module can meter applications across multiple servers but cannot meter software installed on client hard

drives. And unlike other packages in this review, you must monitor software usage by either node ID or user name.

Server monitoring, on the other hand, was the most extensive of the products reviewed, but unlike in BrightWorks, you cannot configure LANDesk to tune the server automatically. Intel has added more than 100 new monitored parameters, which are presented in the form of a collapsible or expandable tree, to view information or set alarms. LANDesk also provides good network traffic monitoring but does not include packet viewers, as does FUN.

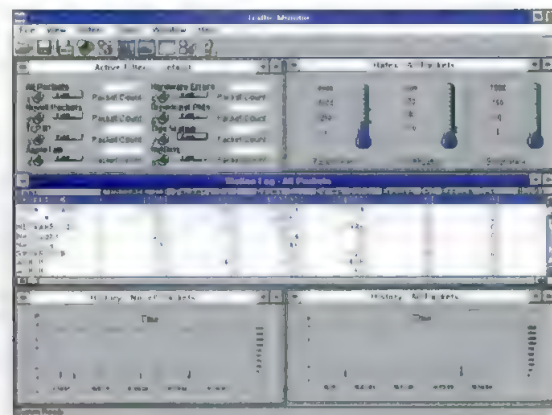
COMPLETE SUITE

With LANDesk, hardware and software inventory can be collected each time a client logs in, and the server can be configured to scan continuously for new software. LANDesk builds DMI-compatible MIF files for each client, another feature we did not find in any other product reviewed. Viewing inventory information is extremely easy, and you can sort on user-defined information such as the serial number or installation date.

LANDesk was the only product in the review group to include built-in virus protection in the base package; this feature scans both workstations and network servers. For real-time scanning on the server, you'll have to purchase Intel's Virus Protect (\$995 per server). Intel maintains a

SUITABILITY TO TASK

LANDesk Management Suite	
HW and SW inventory	Good
Software distribution	Good
Application metering	Good
Server monitoring	Excellent
Network traffic statistics	Good
Remote-control features	Good
Virus protection	Fair
Integration	Excellent



LANDesk's integrated network traffic monitor shows packet traffic numerically and graphically; it also generates historical trends.

Buyers' Guide: Server-Monitoring Tools

By Padraic Boyle

You don't want to operate your network blindly. These tools get inside your network file servers and find out what's really going on.

Server monitoring tools provide valuable information on processor utilization, memory allocation, caching, network packets, and other network statistics. You can use these statistics to increase network performance, diagnose existing network problems, and detect potential problems before they occur. For example, information on hard disk space and adapter load can help you anticipate the need for hardware upgrades. Analyzing a server's operating trends can help you figure out how to change a few parameters in NetWare to increase server performance.

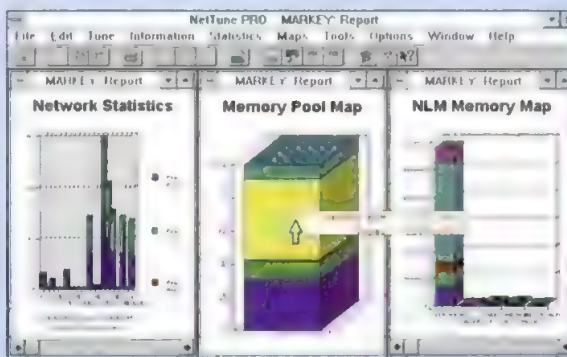
We looked at HawkNet's NetTune PRO 2.2, as well as Intrak's ServerTrak for Windows 2.1 and TrendTrak 2.03. These products offer real-time and historical statistical information on your network's overall health. For the uninitiated network manager with little or no time available to monitor and adjust server parameters, NetTune PRO, with its built-in automated server tuning, is probably the best solution. ServerTrak and TrendTrak are most useful for the experienced network manager who has the knowledge to analyze the information provided and take action on his or her own.

NETTUNE PRO 2.2

NetTune Pro consists of a Windows management utility that loads on the clients and an NLM that loads on a NetWare 3.x or 4.x server. In addition to providing more than 110 different server statistics, NetTune PRO lets you fine-tune NetWare servers on the fly using the SmartTune, TimeTune, and UserTune features.

With hardly any intervention from

the administrator, SmartTune monitors 13 NetWare parameters, including memory levels and packet size, and adjusts them dynamically to achieve optimal performance. TimeTune lets you monitor and modify all 162 NetWare 4.x and 60 NetWare 3.x parameters after hours. During a backup at the end of the day, for example, you can set up the program to configure



NetTune PRO's multitude of reports help you maximize a server's performance.

the server for maximum backup and then return the server back to its original state. UserTune allows you to modify 160 NetWare 4.x parameters with the click of a mouse button.

Flexible charting and graphing and customizable reports round out an exceptional product. McAfee's BrightWorks 2.1 (reviewed in the main section) integrates NetTune PRO into its suite of network tools, and other vendors also plan to bundle the product. *List price: one server, \$895, and \$649 per additional server; 5 servers, \$2,899; 10 servers, \$4,899. HawkNet Inc., 800-729-5638.*

SERVERTRAK FOR WINDOWS 2.1, TRENDTRAK 2.03

Intrak offers a two-piece solution for monitoring server statistics and trends. ServerTrak uses a pair of NLMs on the server and a client-based Windows front end to provide server data in real time to any clients you choose as monitoring stations.

You can set up ServerTrak to dis-

play information for multiple servers on one screen. Like NetTune PRO, ServerTrak can view all of NetWare's parameters. However, you cannot change any of the parameters from the ServerTrak monitoring station. Included documentation and on-line information provide advice on changing parameters in NetWare and other operational recommendations.

ServerTrak includes Stop Watch, a unique feature that lets you record and play back network transactions to see how the server responds. This is useful for tuning servers for both existing and new software packages.

TrendTrak 2.03 is a DOS-based package (a Windows version will be available by the time you read this) that gathers many types of server data over a manager-specified period of time and produces a trend analysis report. The information in the

report can be used to optimize performance of a NetWare 2.x, 3.x, or 4.x server. Trend information is gathered using an NLM, and the data is analyzed by the client module, which can create customized graphs based on the data. You can also collect detailed information on individual network adapters to determine which adapter or segment may be malfunctioning.

The program collects data every 30 minutes and generates a daily summary file. Don't worry about disk space: Files only take up about 16K for a day's activity and 6MB for a whole year's worth of data.

The combination of ServerTrak's monitoring capabilities and TrendTrak's capacity planning can help any network manager achieve the best network performance now and in the future.

ServerTrak for Windows 2.1. *List price: one server, \$249; 10 servers, \$1,249. TrendTrak 2.03.* *List price: one server, \$595; \$395 per each additional server. Intrak Inc., 800-233-7494.*

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BBS of updated virus definitions for downloading.

Remote management tools in LANDesk include simple-to-use remote control, file transfer, and chat programs. LANDesk can even control the console screen of NetWare file servers without the security risk of Novell's insecure REMOTE.NLM, which uses a text password stored on the server. Intel replaces REMOTE.NLM with USER.NLM, which encrypts the password.

Like Saber LAN Workstation, LANDesk has a BASIC-like scripting language

Buyers' Guide: Virus Scanning Tools

By Padraic Boyle

As if you didn't have enough to worry about, viruses can wreak havoc on a network. These insidious creations can destroy documents, corrupt data, and reformat hard disks. With the help of virus protection software packages such as these, network managers can feel confident not only that the network servers are safe but that their client PCs are clean, too.

All virus protection programs have some ability to detect viruses and clean and repair infected or damaged files. Each of the products we tested for this sidebar can detect more than 5,000 viruses; they also include facilities to update virus dictionaries from the vendor. All three products include detailed information on the potential damage that each virus can create, along with a list of symptoms and steps to take in the event your system has been infected.

The primary differences among the packages lies in the methods they use to detect viruses, and whether they are implemented as a NetWare Loadable Module (NLM), TSR, or both.

NLMs run on the file server and can be scheduled to scan when network usage is low to reduce server performance degradation. Because NLMs reside in server memory, they are immune to so-called stealth viruses, which hide themselves in programs without making any external changes to the program's size.

In addition to scanning, NLMs can detect viruses as they try to write to the

server's hard disk. By monitoring at the server level, NLMs block viruses before they can disseminate across the network.

On the downside, because NLMs run on the server, they cannot detect a boot virus on a client. Most products that use NLMs also incorporate a TSR module that loads onto the client as part of the log-on script or a batch file and scans the client's hard disk when the PC is booted up.

We examined Cheyenne's Inoculan 3.0, Intel's LANDesk Protect, and TCT-ThunderByte Corp.'s ThunderByte antivirus packages to see how they stack up. Each of these products is directed toward the same goal: protecting your network from viruses. However, each uses a slightly different approach to reach the goal.

Cheyenne's Inoculan features the dictatorial approach of enforcing virus protection by not allowing any client to log on without running the proper utilities, but it works only with NetWare. Conversely, ThunderByte doesn't force antivirus protection on the client, but it is the only package that will operate on most any network operating system. LANDesk Virus Protect emphasizes building a firewall between the server and workstations. Because of these varying approaches, some network administrators use multiple antivirus packages to provide maximum protection. Much of the choice depends on your network philosophy.

★

LANDesk Management Suite

List price: 5 nodes, \$595; 1,000 nodes, \$40,000. **In short:** This version of LANDesk Management Suite offered the most complete management ensemble, with powerful software distribution, hardware and software inventory, application metering, server monitoring, centralized alarm capabilities, and a superb custom report generator. It was the only product reviewed that supported virus scanning in the base package. Installation is better than in previous versions, and the new Alert Management System (AMS) lets you trigger events in other LANDesk modules. LANDesk works only on NetWare servers but integrates well with NetWare Directory Services (NDS).

Intel Corp., 5200 N.E. Elam Young Pkwy., Hillsboro, OR 97124; 800-538-3373, 503-264-7354; Web, <http://www.intel.com>.

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to help automate routine tasks or change the way information is displayed. A well-written guide to the script language includes excellent documentation on how to interface to the management modules.

LANDesk offers excellent software distribution, custom reporting, and NetWare server monitoring, all in a smartly integrated package. We would like to see better network packet analysis and better integration between the software inventory and metering, but LANDesk is overall a strong package for managers of NetWare networks.—Robert L. Morrison

Symantec Corp.

The Norton Administrator for Networks

In less than two years since its introduction, The Norton Administrator for Networks (NAN) has grown into an innovative and powerful enterprise network management suite with excellent central-

ized information features. Through a common, well-designed interface, NAN offers good hardware and software inventory, application metering, and software distribution. But while Symantec sells remote-control and antivirus add-ons that plug into the NAN framework, noticeably missing are server monitoring, good alerting features, and network statistic analysis.

New enterprise features in NAN 2.0

are immediately apparent. From the primary server site you define the other servers and subnetworks in your site hierarchy with NAN's easy-to-use setup options. Symantec has included a remote install option that lets you install NAN to all other servers on the WAN, saving you from having to install it physically at each site. NAN also integrates with HP OpenView for Windows and adds an icon for it

INOCULAN 3.0

Cheyenne's InocuLAN has been in the antivirus arena for more than three years, and its refinement shows. It covers both client and server viruses, and while the other products we examined require that you manually dial into their BBS to download the latest antivirus updates, InocuLAN lets you schedule connections to Cheyenne's BBS for automatic updating. After InocuLAN downloads the files, it propagates them throughout the network to every server and client running InocuLAN.

InocuLAN provides protection for NetWare 3.x and 4.x file servers and for DOS, Windows, and Macintosh clients. InocuLAN for Windows NT, Version 1.0, is also available as a separate package (\$895 for one server; \$3,995 for five servers). It is compatible with Microsoft SMS.

Cheyenne designed a protection scheme that incorporates its ARCserve backup product with InocuLAN. By ensuring that the server and the backup are clean, the two components cover both ends of the data-protection spectrum. Registered Cheyenne ARCserve users can purchase InocuLAN for ARCserve version at half the list price. *List price: \$395 (25 nodes); \$595 (100 nodes); \$995 (1,000 nodes); Cheyenne Software Inc., 800-243-9462.*

LANDESK VIRUS PROTECT 3.0

LANDesk Virus Protect runs a set of NLMs on the server and TSRs on clients. It builds a firewall using a combination of techniques to ensure that the server or client is clear of any known or unknown viruses. The Clean

Room feature scans the server and certifies files that are clean. Real-time scanning prevents known viruses from being copied to the server's hard disk. Integrity Shield write-protects directories and files on the server so that memory-resident viruses can't be written to them.

Once the firewall is established, the program can prevent viruses from entering a secured server or desktop. In contrast, other antivirus programs scan

platform independent. It is ideal for multiplatform environments with a variety of NOSs and OSs, including NetWare, Banyan VINES, and LAN Manager, as well as DOS and Windows.

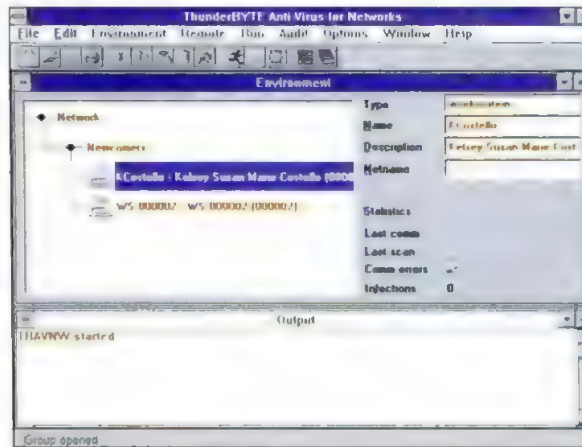
Unlike the other products reviewed here, ThunderByte does not use an NLM. Instead, a set of utilities runs on each client. The network manager uses a designated management station to monitor clients and the server. ThunderByte provides five levels of detection: *signature-based scanning*, which checks for viruses using a library file of known viruses; *learn-as-you-go heuristics*, which learns new viruses based on virus profiles and pattern recognition; *CRC error checking*, which keeps track of file sizes; *real-code emulation*, which tricks a virus into activating itself; and *active monitoring*, which scans disk drives and new files constantly to ensure that servers and clients are virus free.

If the program detects a virus, a message pops up both on the client PC and on the administration station. Although Thunder-

Byte doesn't include any remote-alert notification, you can customize the procedures to call a beeper or phone number.

In addition to virus protection, ThunderByte provides an open system that allows you to configure procedures such as backing up a workstation after the virus scanning is complete or updating drivers on clients that can be scheduled to run on a specific schedule.

List price: \$595 per management station; 50 nodes, \$1,675; TCT-ThunderByte Corp., 800-667-8228.



Instead of an NLM, ThunderByte uses a set of utilities on each client and a management station to scan for viruses.

only on a user-defined schedule.

LANDesk Virus Protect can integrate with Intel's LANDesk Management Suite 2.01 (reviewed in the main section) and with Novell's NMS and ManageWise for a centrally manageable solution.

List price: \$995 per server. Intel Corp., 800-538-3373.

THUNDERBYTE ANTI-VIRUS FOR NETWORKS 6.38

ThunderByte is the only antivirus software we looked at that is network and

processes. When installing from our NetWare 3.12 primary site to Windows NT Server, NAN unsuccessfully attempted to log on to NT using NetWare calls, assuming it was installing to another NetWare server. A Symantec technician quickly remedied the situation by having us remove the default log-on name selected by NAN, after which it recognized Windows NT Server.

to your main console.

Forgoing the use of NLMs, NAN is virtually protocol-independent and runs on almost any NOS using any protocol (although it does not support Novell Directory Services). But while our installation was very easy when we installed from one NetWare server to another, NAN's autodetect feature does not fully account for the differences in some NOSs' log-on

SETTING YOUR SITES

Another very useful enterprise-network feature is NAN's Site Manager, which congregates information from distributed sites. It replicates the inventory, distribution, and metering databases to the primary server in the enterprise hierarchy. The Site Manager runs as a separate process on any Windows clients connected to each server and waits for idle time to exchange

Buyers' Guide: Application-Metering Tools

By Padraic Boyle

Not only do application metering utilities help ensure that your company is complying with the law, they also save you money. Software vendors typically base licenses on concurrent use. Application-metering packages count and control concurrent users so that managers can purchase only the licenses they need instead of a separate license for each user on the LAN.

Software metering tools use three methods: server-based NLMs, program stub files, or Windows or DOS programs on each client PC.

NLMs generally require no software installation on the clients, but they can only monitor server software on NetWare LANs, so you have to configure each metered application to load from the server.

Stub files act as pointers, launching a metering device before an application's .EXE file each time a user starts an application. When the stub is executed, it checks an NLM metering database to see if the license is valid.

A metering product that runs in a client PC doesn't require any modules on a server and therefore is network independent. However, agent software running on client PCs takes up memory. In a DOS environment, the agent is a TSR that usually takes up about 2.5K. Under Windows, the agent operates as a DLL or VxD in extended memory.

If you need to meter a mixed bag of DOS, Windows, OS/2, and Macintosh clients on your NetWare network, then

ON Technology Corp.'s SofTrack 2.5a is the package of choice of the four packages we tested. For networks that have multiple network operating systems, Tally Systems Corp.'s CentaMeter 2.0 and Express Systems' Express Meter 3.0 support NetWare and a variety of other NOSs, including LAN Manager, LAN Server, LANtastic, Windows NT Server, and

AppMeter is the only program of these four to include basic CRC virus protection, but it does not meter or share licenses among multiple servers, nor does it feature queuing of users after a license limit is reached.

AppMeter provides 11 different reports, including current and historical application usage and reports by user.

AppMeter was not as easy to install as Express Meter and SofTrack. You have to modify each client's SYSTEM.INI file in order to load the Windows metering agent. In the next release, due out by the time you read this, AppMeter will automatically install on a client that attempts to access a metered application.

List price: one server, \$595. Funk Software Inc., 800-828-4146.

Application	Licenses	Price	Licenses Required w/out EM	Licenses Required with EM	License Cost w/out EM	License Cost with EM	Savings from EM
Microsoft Word	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Excel	1	\$9.95	1	1	\$9.95	\$9.95	\$0.00
Microsoft PowerPoint	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Access	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual Basic	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual C++	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual FoxPro	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual Studio	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual Studio .NET	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual Studio .NET	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Microsoft Visual Studio .NET	1	\$4.95	1	1	\$4.95	\$4.95	\$0.00
Total	15	\$74.25	15	15	\$74.25	\$49.04	\$25,291

Express Systems' Express Meter can calculate how much money you've saved with metering.

VINES. The only package here that can monitor software on clients as well as servers is CentaMeter 2.0.

APPMETER 1.1

Available since 1992, Funk Software's AppMeter 1.1 is an old timer—right down to its DOS-based front-end. AppMeter uses a combination of an NLM and stubs to monitor DOS and Windows applications running under DOS, OS/2, Windows 3.x, and Windows 95. The stubs are aliases of the program name and allow you to assign different numbers of licenses to groups of users you define. Preferential groups can be designated to receive a set number of licenses.

2.0 includes an option to export to an ODBC 2.0-compliant application such as Microsoft Access or Oracle7 Server.

NAN continues to have very strong hardware and software inventory features, surpassed only by Frye's LAN Directory in depth of information. As with its other products, Symantec has designed the interface to be accessible, convenient-

CENTAMETER 2.0

Like Express Meter, CentaMeter 2.0 is network-independent and does not require any NLMs. After the initial installation, CentaMeter creates a license file for each application. For metering to take place, client PCs must execute CentaMeter agent software, either during the log-on process or via the WIN.INI. Each time an application executes, the CentaMeter agent checks the user count against the license file.

Of these products, CentaMeter is the only one that can monitor applications on a user's local hard disk. Using CentaMeter's time-limit feature, you can even restrict what times applications on local hard disks can be used. For instance, you can specify games to be usable only after business hours.

If an application sits idle for a speci-

information between servers, thus reducing the amount of traffic on the WAN.

From this centralized data, the network administrator at the primary site has easy access to information from anywhere in the network, which can be presented in various preconfigured, customizable report formats and charts. In addition to providing generic export formats, NAN

ly splitting inventory into logical categories such as Network, Operating System, and Memory. No other package in our main roundup provides such effortless access to the inventory data. However, unlike Frye's inventory module, NAN cannot inventory server hardware.

NAN makes creating and submitting software distribution jobs easy. Several

fied amount of time, an inactivity timer can alert users that they are unnecessarily hogging resources and can ask them to close the application. This feature is configurable by application and will omit predefined groups of users—so you can avoid sending a nagging message to senior executives. Unlike with Express Meter, you cannot close the application against the user's wishes. CentaMeter provides a decent number of basic reports and the ability to queue waiting users after a license limit is reached.

List price: \$12 per node for 100 nodes; \$9 per node for 1,000 nodes. Tally Systems Corp., 800-262-3877.

EXPRESS METER 3.0

Easy to install and configure, Express Systems' Express Meter 3.0 provides the most complete application metering solution of the packages here. Unlike AppMeter or SofTrack, Express Meter offers a comprehensive library of more than 200 applications to choose from; you simply enter the number of user licenses that you have purchased for each.

For DOS clients, Express Meter can run either as an optional TSR or as a command line batch file. Windows clients can use agents running as DLLs or VxDs. With its client-based metering approach, Express Meter can operate on a variety of NOSs, and it integrates into Microsoft SMS. It excelled at Queue Management and License Reclaiming. The Queue Management feature can alert a user when a license becomes available and, if the user does not respond, requeue the request.

Unique among this group of products, the Express Meter's License Reclaiming feature can automatically

close an application to retrieve licenses from crashed systems or to prevent long periods of inactivity. If a user has an application open that's idle for a period of time and other users are waiting for a license, Express Meter will close the application.

In addition to metering software, Express Meter can report the total amount of money you have saved through application metering.

List price: 50 nodes, \$1,492.50; 100 nodes, \$2,490. Express Systems Inc., 800-321-4606.

SOFTTRACK 2.5A

Based around a powerful NLM, SofTrack 2.5a meters DOS, Windows, OS/2, and Macintosh applications and installs easily, with no modification to client PCs required: You don't need to install TSRs, Windows agents, or stub files, or change the log-on scripts.

SofTrack's Windows-based administrative module is easy to navigate. It allows the sharing of licenses among multiple servers and the monitoring of suites as single or multiple licenses. When license usage reaches a maximum defined by the administrator, SofTrack puts additional users into a queue. SofTrack's graphing and reporting capabilities are extensive.

By the time you read this, ON Technology will have released SofTrack Version 2.7. One of the unique features slated for the new version is the ability to monitor software on roaming laptops. Users who plan to be on the road simply check out licenses for the applications that they will be using, and when they return check them back in.

List price: 50 nodes, \$795; 1,000 nodes, \$4,995. ON Technology Corp., 800-767-6683.

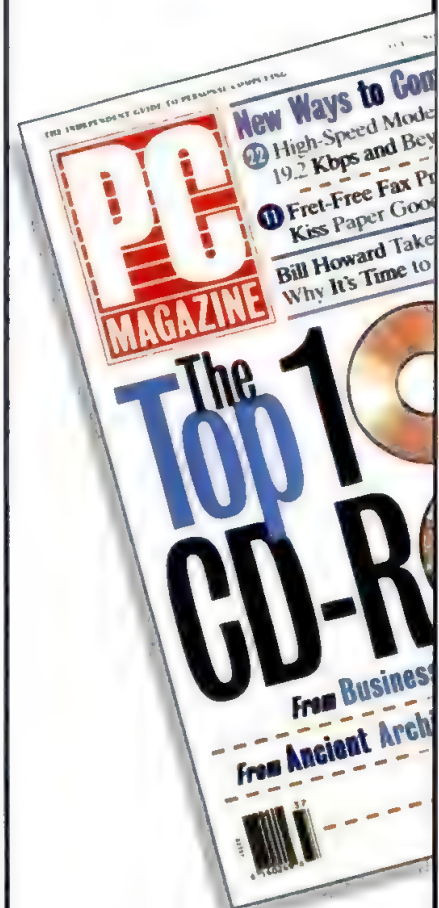
sample distribution scripts, set up for common desktop applications, help you through the process. You can control all the details of the distribution, including whether a user can accept the job, whether to reboot the workstation after the job, and how many times to retry an unsuccessful job.

New to NAN 2.0 is the concept of dis-

tribution packages, which consist of scripts that can be saved and resubmitted as part of other distribution jobs. For example, if you always precede distribution jobs to Windows clients by deleting all the temporary Windows files, you can create this step as a package, then reuse the package in other distribution jobs without having to recreate the steps each time.

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SUMMARY OF FEATURES

Network Management Suites

Continues

PC MAGAZINE
EDITOR'S CHOICE

■ YES □ NO

Products listed in alphabetical order

	BrightWorks 2.1	The Frye Utilities for Networks	LANDesk Management Suite 2.01	The Norton Administrator for Networks 2.0	Saber LAN Workstation 5.0B
List price (50 nodes)	\$2,500	\$5,219	\$4,000	\$2,300	\$3,249
NOS Support					
DEC PathWorks 4.1	■	■ ¹	■	■	■
IBM OS/2 Lan Server 4.0 Advanced	■ ¹	■ ¹	■	■	■
Microsoft Windows NT Server 3.51	■	■ ¹	■	■	■
NetWare 2.x/3.x/4.x	■ ■ ■ ²	■ ■ ■ ²	■ ■ ■	■ ■ ■	■ ■ ■
VINES 6.0	■	■ ¹	■	■	■
Other	None	AT&T's StarLAN ¹	None	AppleTalk	Artisoft's LANtastic
Client OS Support					
DOS 6.22	■	■	■	■	■
Macintosh System 7	■ ³	■	■ ⁴	■	■
OS/2 2.1, OS/2 Warp 3	■ ¹ ■ ¹	■ ■	■ ⁴ ■ ⁴	■ ■	■ ■ ¹
Windows 95	■	■	■	■	■
Windows NT Workstation 3.51	■	■	■ ¹	■	■
Windows 3.x	■	■	■	■	■
Management console platform	Windows 3.x	DOS	Windows 3.x	Windows 3.x, Windows 95 (16-bit), Windows NT 3.51	Windows 3.x
Hardware and Software Inventory					
Inventories hardware	■	■	■	■ (client only)	■
Inventories application software	■	■	■	■	■
Inventories NetWare 3.12	■	■	■	■	■
Inventories client-configuration files	■	■	■	■	■
Tracks changes in files	■	■	■	■	■
Notifies administrator of changes	■	■	■	■	■
Identifies software version	■	■	■	■	■
Client-inventory method	.EXE	.EXE	.EXE	.EXE	.EXE
Compaq IM support	■	■	■	■	■
DMI support	■	■	■	■	■
Server Monitoring and Reporting					
CPU utilization	■	■	■	■	■
Memory utilization	■	■	■	■	■
Disk and volume utilization	■	■	■	■	■
Log-ons and security	■	■	■	■	■
Allows setup of threshold limits	■	■	■	■	■
Notification of threshold limits	■	■	■	■	■
Network-Traffic Monitoring					
Monitors Ethernet-packet statistics and errors	■	■	■	■	■
Monitors packets by MAC address	■	■	■	■	■
Monitors IPX/SPX statistics	■	■	■	■	■
Allows setup of threshold limits before notification	■	■	■	■	■
Software Metering and Licensing					
Meters applications on network drives	■	■	■	■	■
Meters applications on local drives	■	■	■	■	■
Meters applications on multiple servers	■	■	■	■	■

1 Support for this OS is limited to software metering only.

2 NetWare 4.x support is limited to Bindery emulation. NOS support is not included.

3 Support for this OS is limited to software metering and inventory.

4 Support for this OS is limited to virus protection and inventory.

Through one of Site Manager's functions, distribution jobs can be sent directly to other servers via the Replication feature. This is useful for sending driver or NLM updates to remote servers. But unlike a similar procedure in Frye's NetWare Console Commander, you still need to do some on-site maintenance to load the updated NLMs on the remote server.

Simple to set up, NAN's application metering agents work with DOS, Windows, and OS/2 clients and allow you to meter both client- and server-based applications. You can meter known product suites or just as easily generate custom suite specifications of the programs you want to meter. As licenses are relinquished by users, network messages are sent to queued users and the licenses are reserved for them. One of NAN's limitations is that it cannot share licenses across servers, as can BrightWorks and Saber LAN Workstation.

ALL IN THE FAMILY

Additional products from Symantec that are not part of the base package round

▶ FACT FILE

The Norton Administrator for Networks 2.0

List price: 10 nodes, \$500; 1,000 nodes, \$37,000. pcAnywhere for Windows, \$1,592 (10 nodes). Norton Antivirus for NetWare, \$719 (10 nodes) **In short:** Symantec has delivered the right combination of usability and features with Norton Administrator for Networks 2.0. The new enterprise capabilities and protocol independence make NAN suitable for any type of network. Thorough implementations of inventory, metering and software distribution and the ability to seamlessly plug in the various Symantec add-ins for remote control and virus scanning make this a product that can meet most of your needs. However, server monitoring and network traffic statistics are conspicuously missing, and we found the alerting capabilities unsatisfactory.

Symantec Corp., 10201 Torre Ave., Cupertino, CA 95014; 800-441-7234, 408-253-9600; fax, 503-334-7400; e-mail, lcross@symantec.com; Web, <http://www.symantec.com>.

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NETWORKING

Network Management Suites

SUMMARY OF FEATURES

Network Management Suites

Ends

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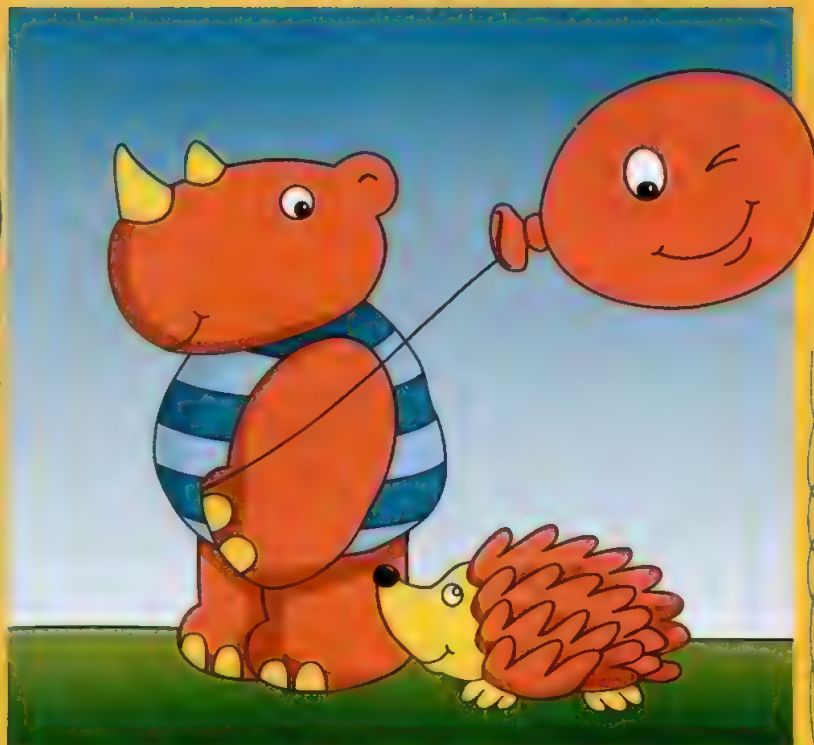
■ YES ■ NO Products listed in alphabetical order	BrightWorks 2.1	The Fry's Utilities for Networks	LANDesk Management Suite 2.01	The Norton Administrator for Networks 2.0	Saber LAN Workstation 5.0B
Alerts manager when license is exceeded	■	■	■	■	■
Allows setup of license limits before notification	■	■	■	■	■
Queues users after license limit is exceeded	■	■	■	■	■
Software Distribution					
Method of distribution	.EXE	.EXE	.EXE	.EXE	.EXE
Distributes to network servers	■	■	■	■	■
Distributes to local drives	■	■	■	■	■
Automatically installs software	■	■	■	■	■
Automatically updates software	■	■	■	■	■
Triggers updates based on inventory information	■	■	■	■	■
Reports on distribution status	■	■	■	■	■
.INI file management	■	■	■	■	■
Virus Protection					
Server	■	■	■	■	■
Client	■	■	■	■	■
Notification and Alerting					
Type of notification	cc:Mail, MHS, NetWare MSG, numeric pager	Alphanumeric pager, cc:Mail, fax, Microsoft Mail, NetWare MSG, Networks	Proprietary, cc:Mail MHS, numeric pager, Play, SNMP, .WAV	None	Alphanumeric pager, MAPI, MHS, NetWare MSG, VIM
Triggers alert when threshold is met	■	■	■	■	■
Client Remote Control					
Remote control over a LAN	■	■	■	■	■
Remote control over a modem	■	■	■	■	■
User can view client-configuration files	■	■	■	■	■
Updates files	■	■	■	■	■
File transfer	■	■	■	■	■
Remote reboot	■	■	■	■	■
Chat function	■	■	■	■	■
Reports					
Predefined reports	■	■	■	■	■
User-definable reports	■	■	■	■	■
Filtered reports	■	■	■	■	■
Data-export formats	ASCII, CSV, dBASE	ASCII, dBASE, ODBC	ASCII, CSV	ASCII, CSV, dBASE, dIF, ODBC, WKS	ASCII, dBASE, Paradox
Technical Support					
Length of free support	Unlimited	Unlimited	90 days	90 days	60 days
Technical support	408-988-4181	617-451-5400	503-264-7000	503-334-8054	214-361-5284
Toll-free technical support	None	800-234-3793	None	800-441-7234	800-526-8086
Hours (eastern time)	9:00-7:00 M-F	8:00-8:00 M-F	10:00-6:00 M-F	10:00-7:00 M-F	10:00-8:00 M-F

out NAN's network management features. These utilities can work as stand-alone products or integrate fully with NAN and add an icon to the console screen. Remote control of clients is available with The Norton pcAnywhere for Windows (\$1,592 for 10 nodes). Norton Antivirus for NetWare (\$599 for 10 nodes) provides server-based virus protection using an NLM that scans all in-

coming and outgoing files in real-time or at specified intervals.

Other Norton Network Series products include The Norton Utilities Administrator 1.0, which contains network versions of Norton's workstation recovery tools (\$350 for 10 nodes); The Norton Desktop Administrator 1.0, which lets you control almost every aspect of clients' desktops (\$450 for 10 nodes); The Norton

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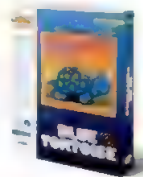
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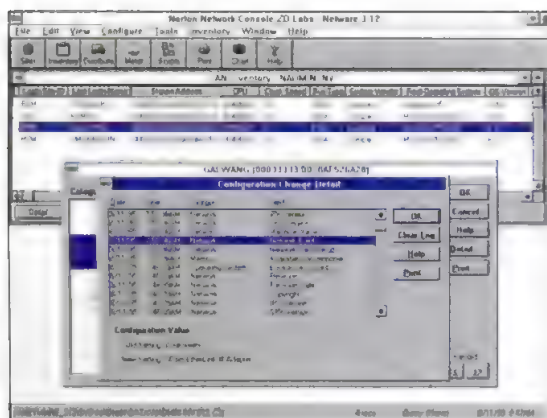
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Network Management Suites



NAN tracks all the details of a workstation's configuration changes—even driver versions.

DiskLock Administrator 3.5, which has a range security options (\$1,190 for 10 users); and The Norton Enterprise Backup 1.0 (\$1,095 per server).

Symantec has integrated NAN's powerful but easy-to-use modules into a cohesive enterprise management suite that works in a variety of network environments. However, server monitoring and network traffic statistics are conspicuously absent, and alerting features are weak. If these tasks are essential to you, you must look elsewhere. Otherwise, for a distributed environment there's no better, more tightly integrated package than NAN.—GCA

McAfee Inc.

Saber LAN Workstation

With McAfee's recent acquisition of Saber Software Corp., the company netted one of the best-selling network management packages, Saber LAN Workstation (SLW).

SLW's popularity is primarily due to its unsurpassed desktop management utilities, which give you powerful DOS and Windows menuing, complete control over desktop PCs, and a print manager. But the LAN administration features in SLW—hardware and software inventory, application metering, software distribution, and remote control—are not as powerful as those of other products we reviewed, and we found installation to be the most difficult of the products we tested.

Similar to the Norton Administrator

for Networks, SLW works through agents that run on client workstations. Separate agents monitor hardware inventory, software inventory, application metering, and software distribution. In addition, SLW has agents for event notification, scheduling procedures, monitoring disk and file usage, and even retrieving NetWare Bindery data. For Windows 95 clients, we installed the DOS agents, which worked fine. Data from each agent category is saved in individual server-based Btrieve databases, called data-

sets, which do not share information among each another.

Although Saber has made several feature improvements with version 5.0B, installation is still a major challenge, requiring much time and planning to make manual changes to every client PC. A getting-started guide explains the numerous installation steps, but you still need to jump back and forth among four different manuals to install the software and set up a Windows client.

DESKTOP DICTATION

Once you get past the difficult installation, you can wield a great measure of control. You can decide which agents to activate on each client by adding parameters to server-based session files. These centralized session files work in conjunction with SLW's custom log-on processor (replacing the log-on script for NetWare or another NOS) and allow you to customize users' Windows environment, menus, and log-on process. This works fine in a NetWare 3.x environment. However, we had difficulties using SLW with NetWare 4.x. Instead of using NLOGIN, we needed to call an external batch file (called SABER.BAT) from each client's AUTOEXEC to log on to a NetWare 4.1 server. We were able to install SLW using Windows NT, also, but had difficulty getting the Btrieve datasets to function properly.

Hardware inventory is fairly detailed but not as complete or easy to access as with NAN or

Frye's FUN. To find an inventory item or component, you have to search laboriously through an alphabetized list of field names (such as CPU type) instead of an organized list of categories (such as network). Software inventory is invoked from a separate program, which can be optionally run during installation or included in each client's session start-up, but it is similarly weak in reporting information.

SLW's application-metering function

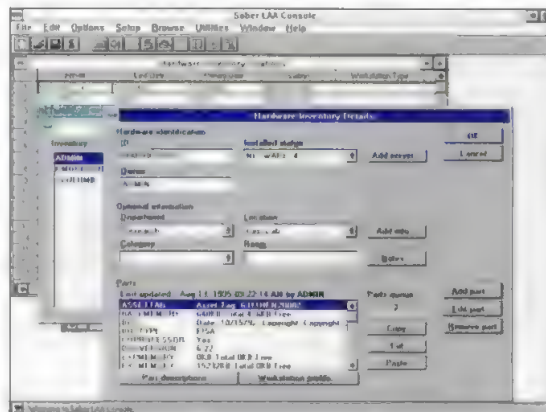
SUITABILITY TO TASK

Saber LAN Workstation	
HW and SW inventory	Fair
Software distribution	Good
Application metering	Good
Server monitoring	N/A
Network traffic statistics	N/A
Remote-control features	Excellent
Virus protection	N/A
Integration	Fair

is good but is limited to DOS and Windows clients. Like many other SLW modules, it is more complicated to set up than that of other products. Windows clients use the WMONITOR agent, which monitors all metered applications automatically. DOS clients must use SMETER, a tag

program that must be added to any batch file or command line for every application to be metered on every client.

From the Saber Console, you can define lists of approved software and configure the metering agent to generate an alert to the manager each time an unknown application is started on a client. This is a clever method of catching unauthorized applications on the network, but it will only work with Windows clients.



While Saber LAN Workstation's inventory is extensive, you must search through a list to find what you're looking for.

► **FACT FILE**

Saber LAN Workstation 5.0B

List price: One node, \$299, \$59 per additional node. **In short:** Saber LAN Workstation (SLW) offers powerful desktop management tools and decent LAN administration tools for NetWare networks. SLW also bundles an excellent remote-control package, ReachOut 4.04. Despite SLW's extremely tricky and time-consuming configuration, its core of administration utilities coupled with superior desktop control can make the installation woes worthwhile. But SLW has poor reporting features and is limited to managing only DOS and Windows clients.

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445 on reader service card

For software distribution, you must use the SaberBASIC scripting language. Creating the distribution scripts is helped immensely by the new ScriptBuilder, a utility that allows you to use templates to build scripts. Distribution scripts can be set up to run until they're accepted or every time a user logs in. For further control, you can select tasks that must be completed before a distribution job can commence, similar to NAN's distribution packages.

SLW ships with ReachOut 4.04, a diagnostic tool for client workstations. Now owned by Stac Electronics, ReachOut is a full-featured remote control program that allows a network administrator to take over a client PC and perform such tasks as changing files, running applications, or rebooting the client. According to Microsoft, however, ReachOut 4.04 does not work properly with Windows 95.

Even though all modules are integrated into the Saber Console, accessing information is somewhat awkward compared with the way it is handled by other Windows-based applications in this roundup. Reports are difficult to generate, and while you can create new report formats from the existing views, you must save them as separate files.

SLW is ideal if you're looking for powerful control over client desktops, as well as decent LAN administration tools. But McAfee should take a hint from other network installation programs and re-vamp SLW's client installation to run from a centralized setup routine, which would eliminate many installation headaches.—GCA □

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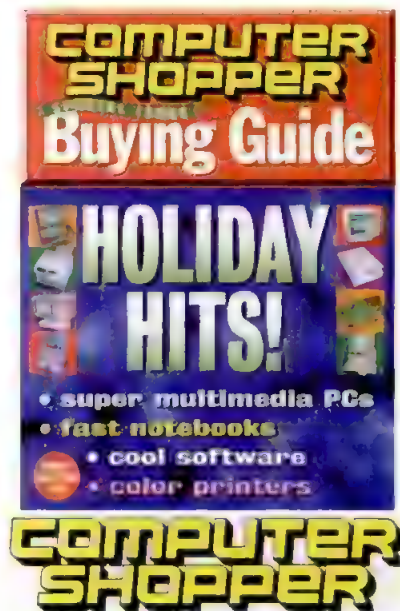


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PC Tech

THE DEFINITIVE GUIDE TO PC TECHNOLOGIES & TOOLS

Smart SQL Query Tools: Safety in Numbers

Two new entrants, Esperant and Impromptu, home in on the ideal: safe queries and easy reporting for nontechnical users.

By Brian Butler and Mark Childers

Data access is a touchy subject with administrators. We're in the middle of a client/server boom fired by lower-cost client/server systems and easy ODBC connectivity. Business managers are clamoring for access to the company data, and there are plenty of Windows packages—from spreadsheets to multidimensional analysis tools—that make it all look so easy.

While they would love to shift query and reporting tasks to users, administrators know that data access can be a minefield.

They know how easy it is for non-experts to get dead-wrong results from database queries. There are just too many traps, from server-killing Cartesian products to subtly incorrect table joins, and any of them can lead to incorrect and misleading query results.

Intelligent query tools, also called *managed query environments*, offer a solution to this dilemma that's looking more plausible all the time. Unlike traditional query tools,



Icons by Hugh Whyte; photograph by Thom O' Connor

IN THIS SECTION



TUTOR The Windows 95 registry may be more robust than the .INI files used in earlier Windows versions, but it's also a lot more complicated to learn.

Jeff Prorise offers a basic tour of the Registry keys, an introduction to the Registry editor, and some practical editing examples to help you customize your system. *page 277*



INSIDE WINDOWS 95 Beneath the slick user interface—sharing and menu-merging of OLE containers and servers lies an abstract world of interfaces

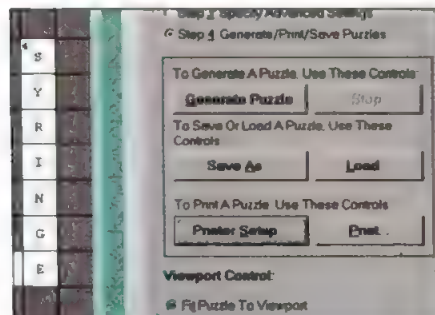
without implementations, with OLE's Component Object Model (COM) at its core. In the second installment of a multipart series, Richard Hale Shaw explores how COM defines the mechanisms that let disparate Windows applications connect and communicate through OLE. *page 281*



UTILITIES The *PC Magazine* Utilities column lightens up with WordJunction, a puzzle generator that turns your custom word list into a crossword or word-

find puzzle. We also look inside WordJunction's Visual Basic code modules to see how the solve and presentation routines were built. As always, the program and its source code are available for downloading through PC Magazine Online. *page 285*

ALSO IN THIS ISSUE PC Solutions looks at built-in accuracy limitations in floating-point calculations, batch files that put the Esc key to good use, tricks for removing print enhancements in WordPerfect documents, useful macros for editing the headers and footers in Excel spreadsheets, and more. *page 293*



The *PC Magazine* Utilities column lightens up.

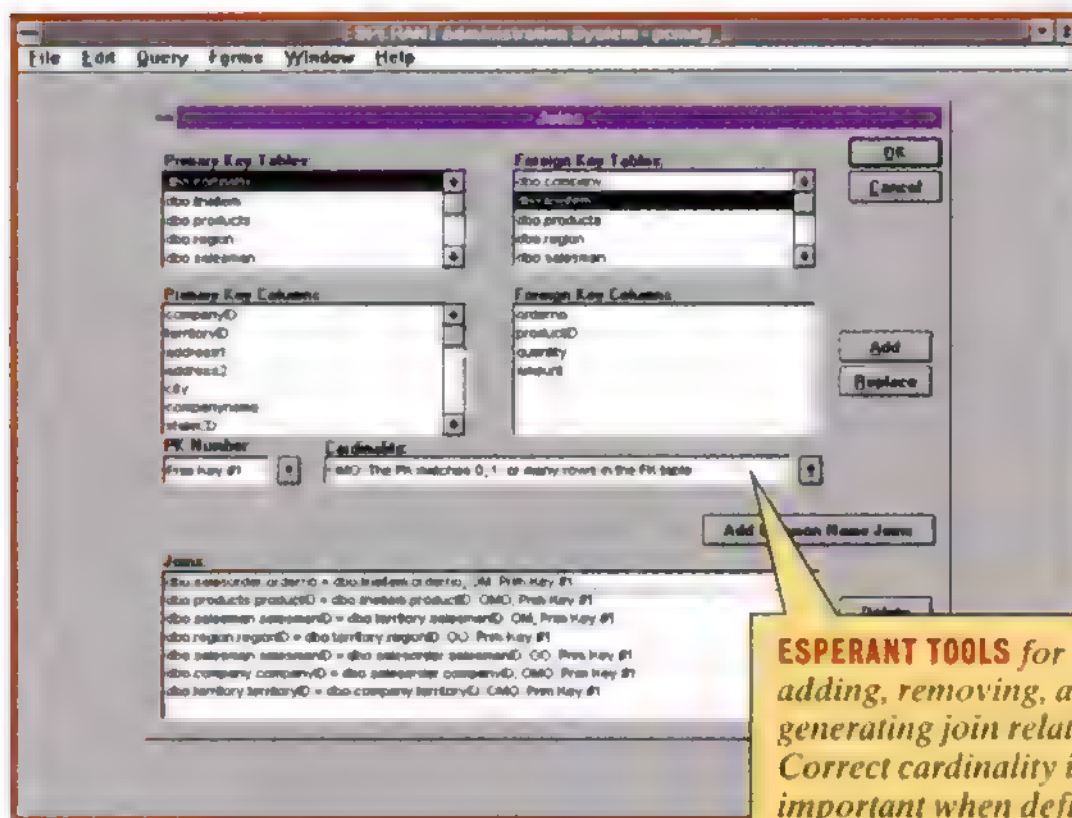


FIGURE 1

these packages use a two-layered administrator/user architecture. The experienced database administrator (DBA) builds a *metayer*, an abstraction of the underlying physical database consisting of a business-oriented model. End users then work with business entities in this model to get the answers they want. The result is a query system where, in theory at least, users can't make mistakes, because the entity definitions and joins are being handled under the covers.

Our last look at query tools ("SQL Query and Reporting: Straight Answers, Limited Risks," June 13, 1995) found several intelligent query products on the horizon but none that had really arrived. Since then, two important new contenders have appeared that change the picture: Cognos's Impromptu 3.02 and Software AG's Esperant 3.0

Esperant 3.0 is an update to Esperant 2.1, a release reviewed in our earlier article. When we tested the older version, we were intrigued by its promise but were hampered by a number of quirks and bugs. All those problems have been fixed in Version 3.0, and the product went through our testing script without a hitch. Our last article narrowly missed Impromptu 3.02, which we test here for the first time. Impromptu also performed admirably in testing and merits serious consideration.

Both tools, and Esperant in particular, come impressively close to the nirvana of letting nontechnical users build queries without a detailed knowledge of SQL (structured query language) or of the underlying data model. While Esperant's natural-language query facility gives it the edge in safe query construction, Impromptu offers more powerful administrative features and more robust reporting.

NEEDED: INTENSIVE ADMINISTRATION

The simplicity and ease that end users will enjoy with these tools is not without adminis-

trative cost. Both tools require that you create a detailed repository containing all the metayer information necessary for end users to build queries. Both products provide a separate administration system to set up this repository.

Although Esperant and Impromptu each use different terminology for the repository, both repositories accomplish the same

ESPERANT TOOLS for adding, removing, and generating join relations: Correct cardinality is important when defining the join relationship.

tasks. Esperant's DataView and Impromptu's Catalog let the administrator mask complexities, enforce security, and create a business-oriented abstraction of the relational database.

At first, Esperant's terminology might seem a little confusing. Esperant uses the term *repository* for a directory containing a set of .INI files that store information about DataViews, users, and groups. Technically, the DataView itself is the repository, since it's where all the metadata is stored. We found out the hard way that you need to use caution when creating new DataViews, even if you use distinct DataView names. Each DataView is a collection of files with standardized names, so different DataViews will overwrite each other if placed in the same directory.

Impromptu calls its repository a Catalog, which it stores as a single file. Unlike Esperant's single DataView type, Im-

MANAGING JOINS in Impromptu: The dialog box shows possible joins between tables and the type of join used.

promptu offers four Catalog types: Personal, Shared, Distributed, and Secured. These specialized repository types make Impromptu extremely well adapted to support the varied needs of even the largest organizations. Personal Catalogs are stored on the user's local hard disk and are intended for situations where only a single user will be running Impromptu. Shared Catalogs are stored on a net-

work drive and are designed for workgroup scenarios. While it is possible to copy the Shared Catalog to the local hard disk of a portable (for use when traveling, for example), updates will not be replicated between the local copy and the Shared Catalog.

This is where Distributed Catalogs come into play. These are designed for workgroups with users that need to work off-line. When a user opens a Distributed Catalog, Impromptu makes a local copy of the Catalog on the user's PC. A link between the local copy and the original source Catalog is maintained, so each user's copy is updated automatically if any changes are made to the original. Secured Catalogs are intended for users who don't need or want to create their own reports or edit them. Users can't change a Secured Catalog in any way.

STUDIES IN ABSTRACTION

The key to empowering nontechnical users is to mask the inherent complexities of relational databases that confront every DBA daily. A good beginning is to provide data-location transparency. Both Esperant and Impromptu can hide connection information such as which server a given database resides on, which database contains the required tables, and what type of database server is storing the data.

The next level of abstraction involves creating a metaphor that presents data to users in an intuitive form (most people don't know set theory, nor do they care to). Impromptu represents tables as folders, and each folder can contain Conditions and Calculations, along with the Data Items (columns). Conditions

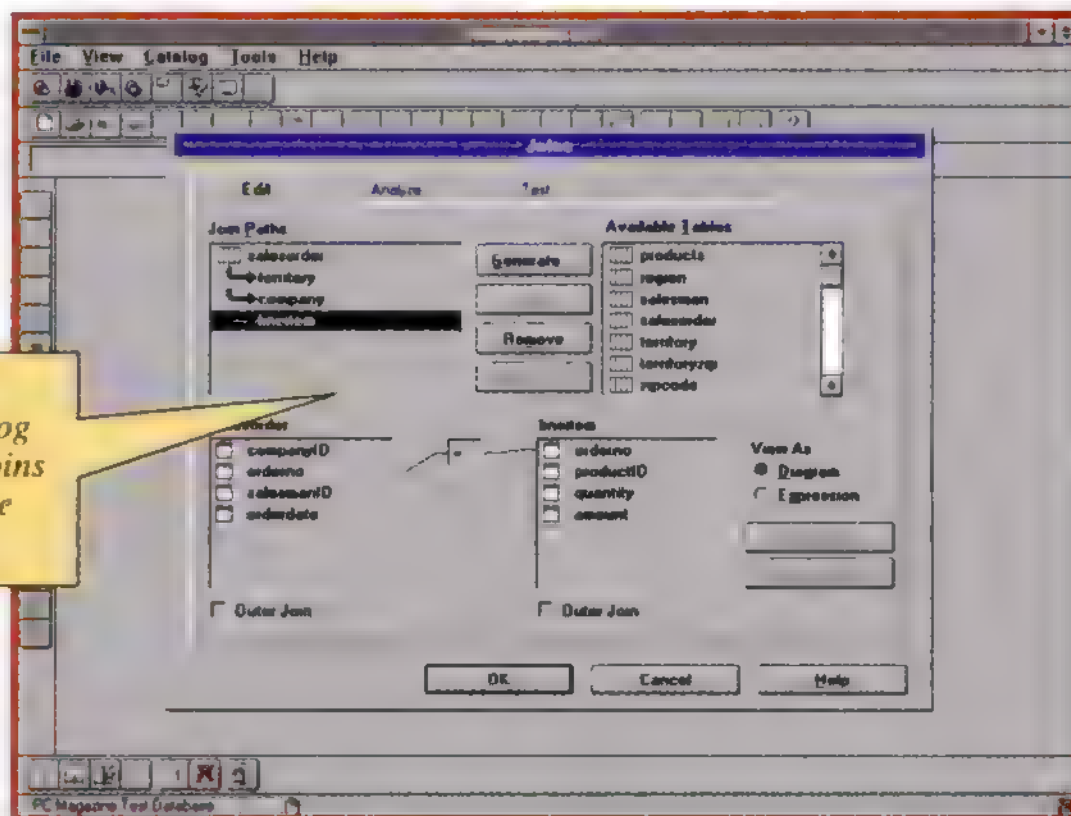


FIGURE 2: Impromptu's join interface.

are expressions that retrieve Data Items based on conditional expressions. The administrator creates Conditions in order to apply security by value or to create views of tables containing subsets of the original data. Whenever a table or Data Item with a Condition is

used in a report, the Condition is automatically added to the report's filter expression. Calculations are essentially virtual columns that can be any valid expression.

Esperant uses the terms Categories and Items to refer to tables and columns in the database. Categories and Items are what users see when they generate queries. A Category does not necessarily correlate directly to a physical database table: Categories can include actual table columns as well as virtual columns (expressions).

Both products support the effective denormalization of underlying tables by allowing database columns to be placed in multiple logical locations. For example, in Impromptu, a Data Item can be placed in multiple folders, and Esperant's Items can be placed in multiple Categories. This allows the data items to be presented to the user in a logical fashion, which might be different from the physical data tables.

Generally, end users prefer normal-sounding column names. While many databases have naming conventions that only an IS department could love, end users would much rather see a column named something like Sales Order Number than SON. Ideally, the system should also provide users with descriptions of data elements—for example, MgrLevel might be described as Manager Employment Level. Both Esperant and Impromptu offer methods of providing real-world names for database columns; only Esperant provides a way to add verbose descriptions to the data elements.

Finally, a query tool aimed at end users must provide a means to abstract the join relationships between tables. For example, if users want to display sales figures for a particular product, they should not have to join Company to SalesOrder, which is then joined to SalesOrderLineItem. Both products bring sophisticated technologies to bear on the problem of join abstraction.

GETTING STARTED

Getting started with Esperant and Impromptu proved to be relatively easy. Both allow you to retrieve all the metadata (data about data) in an existing database, including table and column information, foreign and primary key definitions, and available indexes. Both tools then let you selectively populate the repository.

After your tables are selected, the next step is to define the joins. Both products provide a method of making a best guess at the join relationship between tables. We found Impromptu's auto-join feature was able to deter-

mine more about the relationships between tables than Esperant's. While Impromptu requires somewhat less up-front administration work, however, it does not offer the same high level of protection against incorrect joins or huge Cartesian products as Esperant.

Joins within Esperant are defined in a simple dialog box where you match up the primary- and foreign-key columns (Figure 1). Esperant can automate the join definition

a primary- or foreign-key relationship. Impromptu takes a different approach to solving the problem of multipath joins. The Test feature, accessible in the join dialog, lets the administrator pick two tables, and Impromptu will display what it feels the join strategy should be. If you disagree with the decision, you can fix the problem and retest the join.

One of Esperant's most impressive features is its ability to establish heterogeneous

joins between two separate databases, which need not even be from the same vendor. Esperant will create the SQL necessary to build the cross-database joins. It does this by issuing a separate query to each server, including aggregation and filtering, then retrieving the two respective result sets to the client, where it joins them together.

Impromptu includes a cost-based optimizer to help it identify an optimal join order of tables. The administrator first assigns relative weights to the tables in the catalog: The bigger the table, the bigger its weight. When creating SQL queries, Impromptu uses these weights by ordering the tables in the

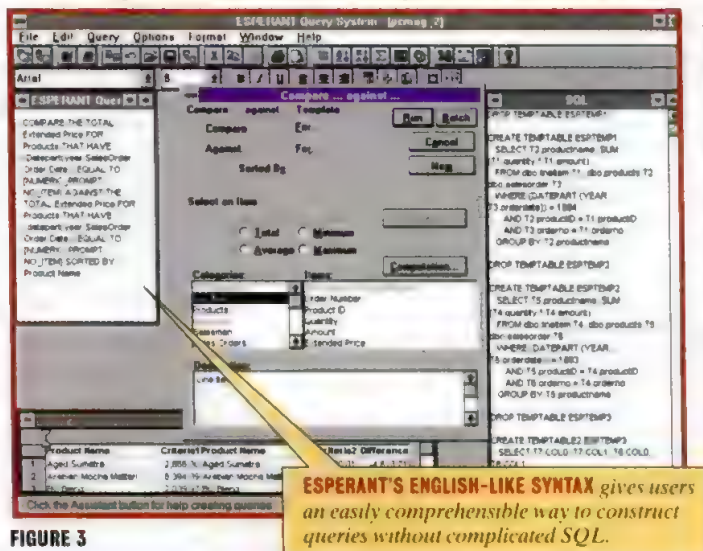


FIGURE 3

process based on common names, but, depending on how your database is designed, there can be drawbacks to this. This is because it is just as important to define the cardinality (the relationship between the primary and foreign keys) as it is to identify the join relationship correctly. Esperant uses the cardinality information to help determine whether a join should be a direct join, an outer join, or even a union of two separate queries. If cardinality information is incorrect, rows may be missing from the result sets. If you let Esperant join on common names, cardinality defaults to a one-to-one relationship, and primary and foreign keys may be incorrectly identified.

Impromptu provides a similar interface for setting up the join relationships between tables (Figure 2). Using a tabbed dialog, the Administrator defines outer joins, adds new relationships, and tests existing relationships. An Analyzer tab offers the unique ability to analyze join information and display any problems in the table joins such as a loop or an isolated table. Once a problem has been resolved, Impromptu automatically displays the next.

There may be cases when users build queries that offer two possible join paths. Esperant handles such multipath joins by prompting users in English business terms to state exactly what they are looking for. You can also set up complex join relationships where table joins are not necessarily based on

FROM clause from smallest to biggest. In most cases, this enables Impromptu to better optimize queries. This feature is especially desirable when used with a database that doesn't include a cost-based optimizer—for example, Oracle 6.0.

SECURITY AND USER PROFILES

Both Esperant and Impromptu address the need for database security, although with varying degrees of completeness. While Esperant's security features are adequate for many users' needs, it lacks some advanced features that may be required in a large organization. Overall, Impromptu offers a more robust and flexible security model designed with the larger enterprise in mind.

Esperant's security module is oriented toward restricting user access to features within the query tool itself. The administrator can control which menu items are available to users, but you cannot restrict users' access to tables and columns. Esperant lets you define rights at the level of users and user groups. You are unable to override the user group profile at the User level, however—if one user in a group requires only one or two profile changes, you will have to create a new group.

Impromptu provides a broader and more impressive set of security features. The administrator can set up user classes that inherit the privileges from another user class. For example, you can derive a user class for sales staff from the class for managers, so that the



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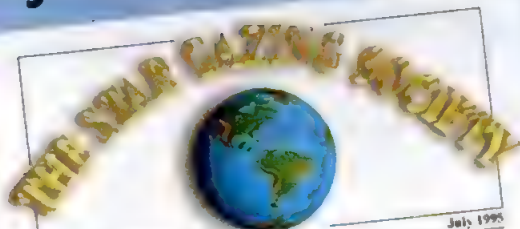


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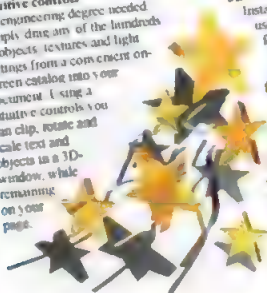
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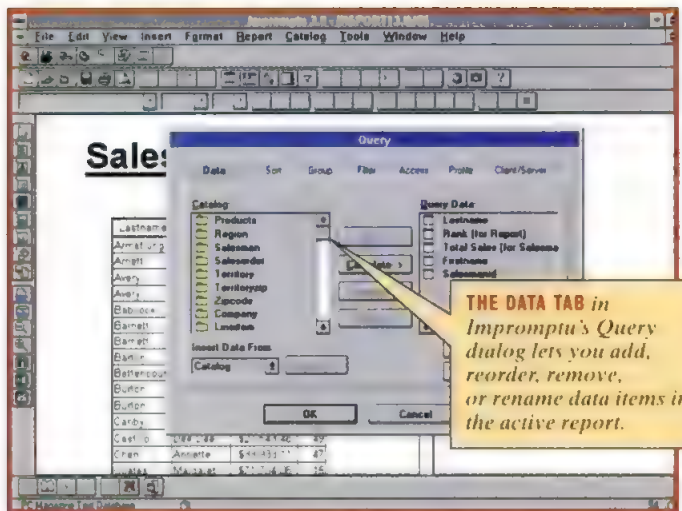


FIGURE 4

salespeople inherit the privileges and restrictions defined for managers. A change to the managers' privileges will automatically be inherited by the sales class. Impromptu's ability to associate filters with a user class lets you tighten security by making it data aware. A filter on a user class limits data retrieval by row access—for example, the salesman from Missouri might see only Missouri sales figures. Filters can be placed on a table-by-table basis.

While both Esperant and Impromptu let the administrator limit the cost of queries, Impromptu is slightly more configurable. Both products let you prevent users from performing outer joins or from suppressing duplicate rows. In addition, the administrator can limit the amount of time a query can run or the number of rows a query can return. Impromptu can notify users as to approximately how long the query will take to execute, giving them a chance to think twice before execution.

Impromptu also provides client/server partitioning, letting the administrator balance the processing of calculations and sorting between the client and the server. You can set this within the user profile on a per-user basis.

Esperant and Impromptu both provide support for MDI gateways to DB2, Microsoft ODBC, Microsoft SQL Server, Oracle, and Sybase. Esperant additionally supports Entire Access and TechGnosis SequeLink, while Impromptu supports Informix, SQLBase, OmniSQL, InterBase, Ingres, Btrieve, dBASE, and Paradox.

QUERY CONSTRUCTION

In both products, we found that the process of generating very complex queries was remarkably easy (Figures 3 and 4). This is where the hard work of the DBA during setup starts to pay off. In general, the more thorough the setup, the easier it will be for users to generate queries and reports.

This is particularly true for Esperant. This

quickly and easily than in Impromptu.

Esperant users (assuming you have granted them full rights) have three available tools for query building: traditional SQL statements, the English-like Esperant language, and the point-and-click Query Assistant interface. Esperant's Query Assistant makes query construction a snap. It utilizes the DataView information to prohibit queries that yield incorrect and misleading results. So when you select your categories (tables) and items (columns) or create aggregates (virtual columns), the system analyzes the

tool required more up-front setup time, partially because more information is needed from the DBA and partially because the system is not quite as automated and its administration interface is not as well honed as Impromptu's. But its Query Assistant and underlying SQL Expert technology really pay back the effort.

Novice users will certainly be able to generate queries more

seen) could not perform this query, since it requires an inner join coupled with an outer join (an invalid query within SQL Server). Esperant's intelligent SQL Expert converted the query into one that utilized Unions to produce the result, an impressive feat to say the least. Another impressive feature of Esperant's Query Assistant is that it can easily generate comparative analyses of two sets of data. Hand-coding similar problems in SQL would take most of a day.

BUILDING REPORTS

Esperant's and Impromptu's approaches to reporting differ in that Esperant separates the query process from actual report generation, while in Impromptu, the two process are intertwined: When building and designing your report, you are actually creating the query.

Esperant does offer a limited WYSIWYG reporting capability that's built into the Query system, however, which is new with Version 3.0 (Figure 5). With it, you can work on basic tabular reports with live data, creating totals, groups, headers, and footers. But for more complicated reports such as crosstabs, mailing labels, or graphs, you will need to use Esperant's separate Reporter module. Once your data has been retrieved, you activate Esperant's Reporter by selecting the toolbar icon. This creates a new report using the current format or starts Reporter's Helping Hand utility, which sends the data to Esperant's banded report writer and steps you through the

process of building the report.

In Impromptu, there are basically two ways to create reports: using a template or building a report from scratch. When you start the report-cre-

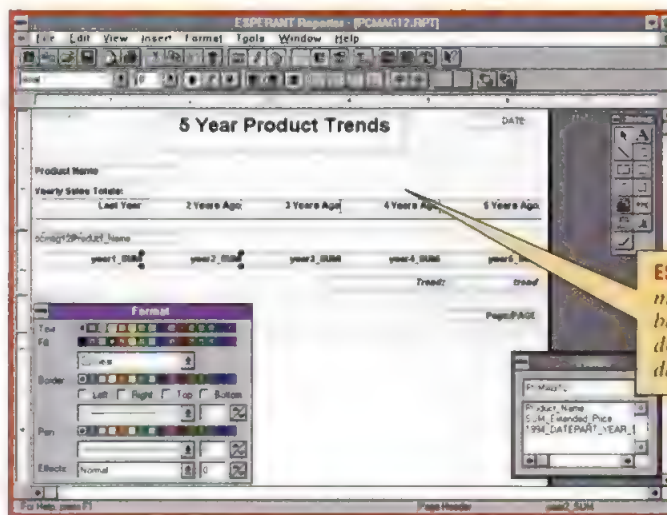


FIGURE 5: Esperant's approach to reporting.

query and then grays out categories, items, and aggregates that would create an invalid query. Esperant virtually eliminates the threat of a user creating an invalid query or Cartesian product.

Esperant was also able to perform our test query, which required an outer join. This query asked for all companies and their sales figures, even if a company did not have any sales. Impromptu (and most products we've

ation process, you are presented with a template palette that is configurable, so you can replace the default templates with templates you use more commonly. At this point, you can either pick a template or design a report from scratch. Impromptu includes dozens of ReportWise intelligent templates to provide a head start on many common reporting tasks. Using these templates is straightforward. Simply choose the appropriate template and you will be greeted with a Data tab in the Query dialog; substitute the place-holders in the template with the appropriate data from the data-

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base. At this point, the report will be generated, and you're done. Additionally, you can change attributes like the filter or sort order to further customize the template. Report templates can be generated after the report-generation phase through a menu option.

Designing a report from scratch is a little more involved in Impromptu, but not difficult. The Data tab is used to add Data Items, specify the sort order, group the data, and select the filter criteria. While the Data tab dialog is very powerful, it is not overly complex. This is where Impromptu excels over rivals like Borland's ReportSmith, since it can use its Catalog information to help the end user in report building. Users can choose from predefined filters and calculations and do not have to worry about how the tables are related since all this information is stored within the Catalog.

Impromptu goes beyond many traditional banded-report generators by giving the user true WYSIWYG report generation (see Figure 6). The end user can see exactly how the report is going to look by test driving it with a selectable subset of live data. Impromptu's reporting user interface is functional and attractive, complete with all the drag-and-drop capabilities we've come to expect from top-notch Windows applications. The one point of criticism is Impromptu's annoying object-selection method. We found that it tended to pick the wrong object or, worse, select every object in the report. Deselection required a hit of the Esc key, not simply selection of another object.

It is ironic that while Esperant's Query System enables novice users to generate correct queries quickly and easily, its Reporter requires much more technical expertise to generate complex reports. Esperant's Helping Hand wizard, however, will help you over some of the bumps.

In contrast to Impromptu, Esperant's Reporter is a separate module and thus not as well integrated into the environment. It also uses a traditional banded-report metaphor, so you cannot work with live data during report design (unless you use the minimal reporting capabilities built into the query module). As with similar tools, users work by placing fields in a skeleton report. We did find Esperant's ability to hide certain bands useful in completing some of our test script reports. At the same time, we found it limiting that you can see only a print preview of a single page of your report to check formatting and layout. You can't see the entire report until you actually print it.

A very nice feature that many report writ-

ers lack, but both Esperant and Impromptu support, is ranking. Under Esperant, restricting your query results to the top 10, or top 10 within a group, is a breeze. Users simply pick a menu option, then define the ranking column and the restriction. Im-

Esperant and Impromptu
each include a
crosstab query feature that
lets users rotate
data into categories
for analysis.

promptu implements ranking via a calculated field, which then can be filtered. While this means Impromptu's ranking mechanism is a little more involved, it does allow for greater flexibility in the type of reports you can generate. For example, Impromptu can easily generate a report of salespeople in alphabetical order, with their sales rankings displayed, something that is far more difficult in Esperant.

Esperant and Impromptu each provide

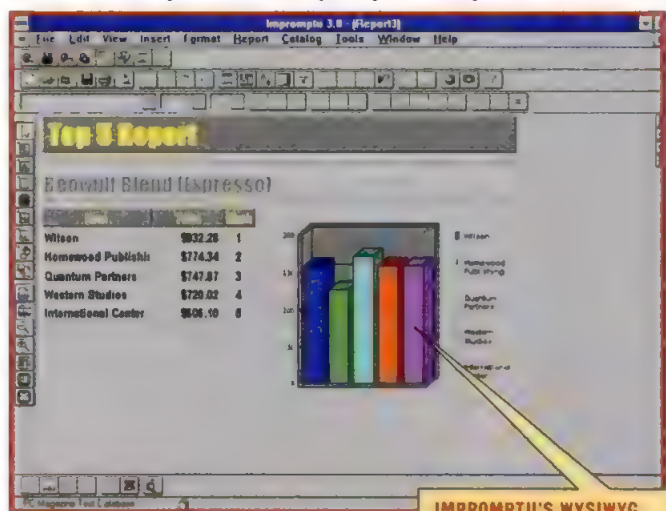


FIGURE 6

their own charting engine. In addition, both include a crosstab query feature that lets users rotate data into categories for analysis. For those who require data-pivot and drill-down features, Impromptu can be integrated with Cognos's PowerPlay 4.1, a tool designed for multidimensional analysis (PowerPlay must be purchased separately). Both Esperant and Impromptu give you the ability to add prompts for query criteria (for example, the

query year) instead of having to hard-code the restriction. This useful feature lets you create generic, reusable reports.

SCRIPTING AND AUTOMATION

Impromptu provides a powerful scripting language called CognosScript that allows macros to be run standalone or embedded within a report. CognosScript supports OLE 2.0 automation, allowing you to integrate other applications within the Impromptu environment. This raises Impromptu to the level of a report development system, complete with a dialog editor and a macro editor that supports debugging with break points, watch variables, and animation.

Esperant also added a scripting language with Version 3.0 that lets users create scripts to automate the tasks of running queries, reports, and even exports to other applications. This feature combined with Esperant's new Executive Desktop—which lets users attach icons to scripts and display them in a convenient menu for quick execution—provides a platform for even the most novice users to generate and print their reports. Both Esperant and Impromptu have also added Batch Scheduling utilities so that you can schedule long-running reports to run during off hours.

Both Esperant and Impromptu allow OLE 2.0 objects to be placed within the report. Impromptu itself is an OLE 2.0 server, so you can embed Impromptu reports within other applications. If you need more analytical power than Esperant offers, Esperant makes it easy to export data to standard spreadsheet applications through a toolbar button.

Overall, both Esperant and Impromptu are ready to roll out. Your choice may well depend on the size of your organization and the skills of your end users. Esperant's superb English-based query facility offers a wide margin of safety when set up correctly. Its drawbacks are a somewhat rough-and-ready administration interface and still-immature reporting capabilities. Impromptu's query interface requires somewhat more skill on the user's part, but it's a smoother and more mature package for administration and reporting. But both products clearly herald the arrival of intel-

ligent query tools and the obsolescence of older packages aimed at experts only. □

Esperant 3.0. List price: \$595. Software AG of North America Inc., Reston, VA; 800-423-2227.

Circle 484 on reader service card

Impromptu 3.02. List price: \$695. Cognos Corp., Burlington, MA; 800-426-4667.

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By Jeff Prosis

Exploring the Windows 95 Registry

The new way of storing system and application preferences.

Most people who use Windows have at least a passing acquaintance with .INI files and with the WIN.INI and SYSTEM.INI files in particular. WIN.INI is a text file stored in the Windows directory that holds configuration information about Windows and some of the application programs that it hosts. SYSTEM.INI is a text file containing hardware information and system settings. That Windows 3.1 stored such important information in plain text files that were easily deleted, modified, or otherwise tinkered with was widely regarded as an Achilles' heel. And the linear, top-to-bottom organization of these files meant that neither WIN.INI nor SYSTEM.INI was an efficient vehicle for preserving complex configuration settings across sessions.

In Windows 95, persistent configuration data is stored in a binary, hierarchically organized database known as the *system registry*. You don't see it; many users aren't even aware that it's there, because it's not exposed the way WIN.INI and SYSTEM.INI are. There are still .INI files around in Windows 95, but they are there primarily for compatibility. Many 16-bit applications still use them, but 32-bit applications generally use the registry instead. If you installed Windows 95 over Windows 3.1, the Windows 95 setup program automatically copied many of your preferred settings from the .INI files to the registry. And when a Win32 application writes configuration settings out to the hard disk, chances are it writes directly to the registry. Using .INI files is rapidly becoming an anachronism, and one day we'll be able to do without them entirely. If you primarily run 32-bit applications under Windows 95, you can probably forget about them already.

The registry contains an abundance of information regarding your PC, Windows 95, and the applications that you run—far more than WIN.INI and SYSTEM.INI ever contained. Let's take a look inside to see what kinds of interesting things we can find.

REGISTRY OVERVIEW

The Windows 95 registry is a centralized database containing information

placed there both by the operating system and by the application programs that it hosts. Physically, the registry is stored as a pair of binary files named USER.DAT and SYSTEM.DAT located in the Windows directory. USER.DAT contains information that is unique to each person using the system—for example, user preferences that are restored each time a user logs in. SYSTEM.DAT contains global system settings such as a list of installed hardware devices. Both files are marked with hidden, system, and read-only attributes to set them apart from normal files and to provide protection against accidental deletion.

Logically, the registry is a unified database entity with a tree-like structure that resembles the directory structure of a disk. An entry in the registry is analogous to a file. The entry consists of two parts: a *value name*, which identifies the entry just as a filename identifies a file, and a *value*, which is analogous to a file's data. Entries are stored under keys and subkeys just as files are stored in directories and subdirectories. On a disk volume, the pathname

`\Programs\Win32\Calc.exe`

identifies a file named Calc.exe that is stored in the subdirectory \Programs\Win32. Similarly, in the registry, the name

`HKEY_LOCAL_MACHINE\Security\Provider`

identifies a value named Provider under the subkey HKEY_LOCAL_MACHINE\Security. Technically speaking, HKEY_LOCAL_MACHINE is a *key* name and Provider is a *subkey* name. The registry has no root directory (although "My Computer" can be thought of as a root directory).

HKEY_LOCAL_MACHINE is one of six special "root keys" that form the uppermost level of the registry's hierarchy. The others are HKEY_USERS, HKEY_CURRENT_USER, HKEY_CURRENT_CONFIG, HKEY_CLASSES_ROOT, and HKEY_DYN_DATA. We'll discuss what's stored in these branches, or *subtrees*, of the registry in a moment.

You can browse the registry and examine the information stored there with the Registry Editor, or RegEdit, utility supplied with Windows 95. You'll find RegEdit on your hard disk in the Windows directory; the filename is REGEDIT.EXE. Be careful not to delete or modify any registry entries inadvertently as you browse. If you do delete something you didn't intend to, see RegEdit help for a description of how lost entries can be recovered. It's not a good idea to edit the registry manually unless you know precisely what you're doing. Figure 1 shows what the RegEdit window looks like the first time you open it. The left pane contains key and subkey names, and the right pane contains registry entries. Initially, RegEdit displays only the root key names. You can expand a branch

of the registry and reveal subkey names by clicking one of the small boxes with a plus sign. Frequently the subkeys contain subkeys too, and you can keep expanding until there are no more subkeys to open.

To view the entries associated with a particular subkey, click the subkey name in the left pane to highlight it. The entries will be displayed on the right. Every subkey has at least one entry: an unnamed entry labeled (Default). The default value is always there, but it isn't always assigned a value. Figure 2 shows what the RegEdit window looks like with the HKEY_CURRENT_CONFIG root key expanded and the registry entries for HKEY_CURRENT_CONFIG\Display\

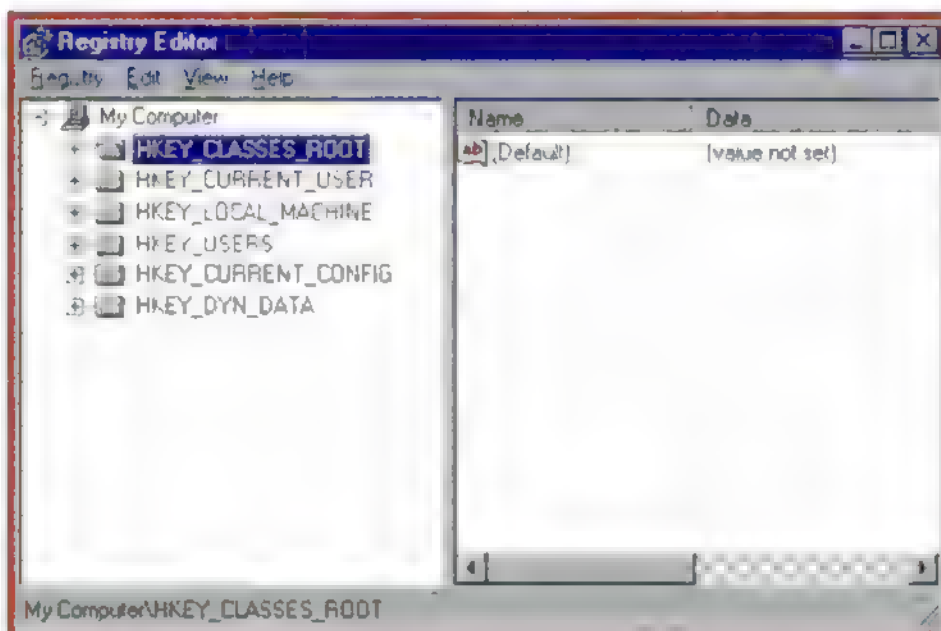


FIGURE 1: The Windows 95 Registry Editor is the perfect tool for browsing the registry and exploring its contents. Keys and subkeys are shown on the left, and data values are shown on the right. Clicking on a + sign expands a key.

Settings displayed. This is where the operating system stores information regarding your display configuration: the screen resolution, the number of colors, the default system font, and so on. Here, the screen resolution is 1,024 by 768 pixels, and the number of colors is 256 (2 raised to the power of the registry's BitsPerPixel value, or 2⁸). The next time the computer starts, Windows will look at this location in the registry to determine how to initialize the video hardware.

All the values associated with HKEY_CURRENT_CONFIG\Display\Settings in Figure 2 are text strings, as indicated by the small "ab" icon next to each entry. Registry entries can also be assigned binary data values consisting of numbers. Binary data values are identifiable by icons emblazoned with 1s and 0s rather than the letters "ab."

If you use RegEdit to go exploring, you'll find that the registry contains hundreds of entries concerning all kinds of information—some of it decipherable, some of it not. It's impossible to document the meaning of every subkey and every data value. The sheer number of entries is enough to discourage most from trying, but there's also the problem that many entries are meaningful only to the application that created them. Even the entries created by Windows itself are largely undocumented, and registry entries vary from computer to computer according to hardware and software installed. Still, there's a lot you can learn if you're willing to dig deep enough. Let's examine each of the six major branches of the registry to see what's stored in them.

HKEY_USERS

HKEY_USERS is the repository for information regarding users and their preferences. At a minimum, it contains one subkey named .Default that stores a default profile for users who log on without a personal profile. (A personal profile is created by logging on with a new user name and answering yes when Windows asks if you'd like individual settings to be retained. If you're not asked this question but would like to be asked in the future, select Settings | Control Panel from the Start menu, open the Passwords icon, and, under User Profiles, click the button that enables Windows 95's customized preferences feature.) When a personal profile is in effect, HKEY_USERS also contains a subkey with the user's profile name. A list of stored profiles can be found in the registry under HKEY_LOCAL_MACHINE\Software\Microsoft\Windows\CurrentVersion\ProfileList.

Values attached to subkeys underneath the .Default and profile-name subkeys store the profiles themselves. A personal profile for the current user is built at runtime from a .PWL file in the Windows directory, and

other part of the registry. Any changes made to the current user profile in HKEY_USERS are automatically reflected in HKEY_CURRENT_USER, too.

At first an alias might seem duplicitous,

but there is a reason for it. When an application writes private settings to the registry, the full key name that it uses is HKEY_CURRENT_USER\Software\Company-Name\ProductName\Version. Because HKEY_CURRENT_USER is transparently mapped to the current profile subkey under HKEY_USERS, the information written there affects only the current user. Thus, in Windows 95, one user can configure an application program one way and another user can configure it completely differently, and each will see his or her preferences restored the next time the application starts. This assumes, of course, that the application abides by the guidelines and uses the registry. Most 32-bit apps do, while 16-bit apps

don't, so you won't get the full benefit of user-specific application settings until you upgrade your apps to 32-bit versions.

HKEY_LOCAL_MACHINE

HKEY_LOCAL_MACHINE is the location where the operating system stores information about your computer, including a list of hardware devices installed, the device drivers that service them, and driver settings. The Config subtree contains a list of hardware configurations. Each time it's started, Windows 95 examines your PC's hardware and, if possible, picks a matching configuration from HKEY_LOCAL_MACHINE\Config. This allows it to adapt to changing hardware environments, such as those encountered on portables with docking stations. Another point of interest is the Enum subtree, which lists all the devices detected by Windows 95's bus enumerators—routines called at start-up to enumerate the devices installed on the system bus (or buses). Browse this branch of the registry and you'll find, among other things, a list of the disk drives installed in your PC and the drive letters currently assigned to them. Information regarding serial ports is stored separately in the HKEY_LOCAL_MACHINE\Hardware subtree.

The System subtree contains hardware configuration information such as the file systems installed (for example, CDFS for CD-ROM drives) and a list of the virtual device drivers, or VxDs, that are loaded at start-up. Information stored here is organized into "control sets," each of which completely describes one hardware configuration. The subtree System\CurrentControlSet contains

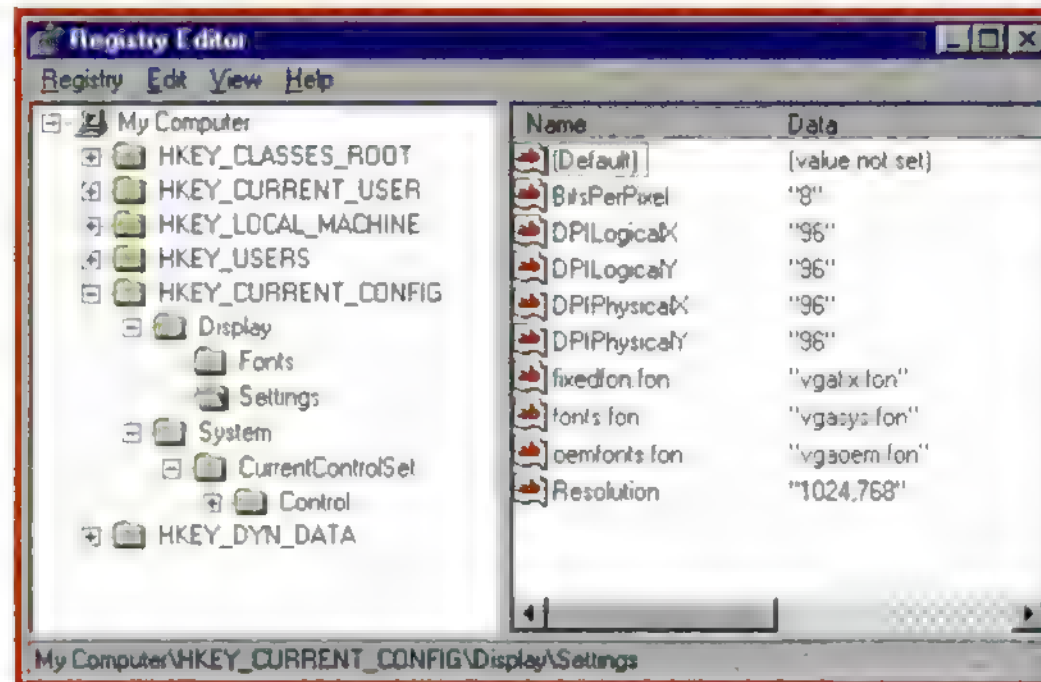


FIGURE 2: When you highlight a subkey name in the left pane of the Registry Editor, the values associated with it appear in the right pane. HKEY_CURRENT_CONFIG\Display\Settings (shown here) stores a record of the current video configuration, including the screen resolution and color depth.

profile data is stored in subdirectories in the Windows directory's Profiles subdirectory—for example, C:\Windows\Profiles\Jeff. The subkeys include, among others, AppEvents, which maps system events to sounds; Control Panel, which stores user preferences such as screen colors and keyboard settings; and Network, which keeps records of network connections, both persistent and temporal.

The Software subkey is where most Win32 application programs write information in order to preserve it across sessions. In previous versions of Windows, developers usually stored application settings either in WIN.INI or in private .INI files. In Windows 95, developers are encouraged to store private settings under the current profile's Software\CompanyName\ProductName\Version subkey, where CompanyName is the company name, ProductName is the application name, and Version is the version number. Expand Software\Microsoft and you'll see subkeys for several Microsoft applications, including one for Windows itself (Software\Microsoft\Windows). As time goes on and you acquire more 32-bit applications, the Software branch of your user profile will grow accordingly.

HKEY_CURRENT_USER

HKEY_CURRENT_USER is an alias for the current HKEY_USERS profile subkey. If you expand both HKEY_CURRENT_USER and the subkey corresponding to the current user under HKEY_USERS, you'll find that the subtrees are identical. Alias means HKEY_CURRENT_USER is an address that points to an

information regarding the current configuration.

HKEY_LOCAL_MACHINE\Software contains global software settings for the operating system and application programs. Win32 setup programs frequently write into this area of the registry when applications are installed. The most interesting part of the Software subtree is HKEY_LOCAL_MACHINE\Software\Classes, which stores information about filename extensions and how files with those extensions are handled by the operating system shell. Entries stored here are not normally accessed directly, but through the alias HKEY_CLASSES_ROOT. The following section describes this part of the registry in more detail.

HKEY_CLASSES_ROOT

HKEY_CLASSES_ROOT is an alias for HKEY_LOCAL_MACHINE\Software\Classes. Browse HKEY_CLASSES_ROOT and you'll see a long list of filename extensions such as .exe and .bmp. Most of the extensions have no subkeys, but are assigned string values such as "exefile" for .EXE files and "Paint.Picture" for .BMP files. Look further down the Classes subtree and you'll find subkeys for these string values. These subkeys typically contain other subkeys such as Default Icon, which identifies the icon that the shell displays for files of this type; shell, which tells the shell how to open and print; and shellex, which lists *shell extensions*—context menu extensions, property sheet extensions, and other plug-in software components supported by the shell—associated with this file type.

What HKEY_CLASSES_ROOT amounts to is a database of instructions that lets the shell treat otherwise ordinary data files as if they were documents whose internal file formats are understood. Suppose you double-click a .BMP file icon or right-click it and select Open from the context menu. How does the shell know how to open that .BMP file? Easy: It checks HKEY_CLASSES_ROOT for a .bmp

entry, sees that its value is Paint.Picture, and consults Paint.Picture for the command to open the file. In this case, Paint.Picture contains a shell\open\command subkey whose default value is MSPAINT %1, which tells the shell to start MSPAINT (the Windows Paintbrush program) and pass it the filename. As if by magic, MSPAINT starts up and the .BMP file is loaded. If you had chosen to print the .BMP file instead, the shell would have retrieved the print command (MSPRINT /P %1) from

HKEY_CLASSES_ROOT
is a database of
instructions that lets the
shell treat ordinary files as
if they were documents
whose internal file
formats are understood.

HKEY_CLASSES_ROOT\Paint.Picture\shell\print\command.

With RegEdit, it's possible to customize Windows 95 by adding your own commands to the context menus that pop up when file-system objects are right-clicked. Suppose you want to add an Unzip command to the context menus for .ZIP files that, when you select them, invoke PKUNZIP. Here's how you do it:

- Create a subkey under HKEY_CLASSES_ROOT named ".zip" and set its default value to "zipfile."
- Create a zipfile\shell\unzip subkey under HKEY_CLASSES_ROOT and set its default value to "&Unzip." (The ampersand identifies the menu item's shortcut key.)
- Add a command subkey to HKEY_CLASSES_ROOT\zipfile\shell\unzip and set its default value to the command that invokes PKUNZIP and passes it the filename—for example, "c:\dosutils\pkunzip %1." Figure 3 shows what the resulting ZipFile subtree looks like. Now you can unzip a file simply by right-clicking it and selecting Unzip from the context menu. Because PKUNZIP is a DOS application, a DOS window will appear that you may have to dismiss

with the Close button. In the future, some Windows applications will support a /S (for "Silent") switch or something similar commanding them to run without creating a window. Such applications will run well from context menus because they'll do their work invisibly.

There's much more to this branch of the registry that we'll have to put off until another day. For example, special entries such as Drive, Folder, and Printers allow third parties to install shell extensions for drive, folder, and printer objects. (For more on shell extensions, see the Tutor column in our issue of April 11, 1995.) The CLSID subtree of HKEY_CLASSES_ROOT contains 128-bit class IDs for shell extension DLLs and other OLE component objects. The QuickView subtree correlates filename extensions to the quick viewers invoked from context menus. One of the interesting things you'll find if you browse the shellex subkeys is that the operating system uses many shell extensions itself. For example, the Tools page that appears in the property sheet for a drive object isn't hardwired into the operating system, but is added by a property sheet shell extension named DiskTools. Viewing the operating system at this level reveals a lot about its makeup and in particular highlights the modular and very extensible design of the shell.

HKEY_CURRENT_CONFIG

HKEY_CURRENT_CONFIG is an alias for the active configuration in HKEY_LOCAL_MACHINE\Config, usually HKEY_LOCAL_MACHINE\Config\0001. Providing an alias for the current configuration gives Windows ready access to configuration information that is specific to the current session.

HKEY_DYN_DATA

HKEY_DYN_DATA contains configuration information that is "dynamic"—that is, stored in RAM rather than on the hard disk so that it can be written and read very quickly. The Config Manager subtree contains a record of all installed hardware devices, the hardware keys used to identify them, and their current status, while the PerfStats subtree holds performance statistics for network components. PerfStats is apparently used by the System Monitor applet to provide performance data regarding remote systems.

There is much more to discover in the registry, of course. Just for kicks, use RegEdit to inspect HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\Tips and see what's stored there. (The final subkey name should provide a clue.) Then put on your explorer's hat and go sailing on your own; you never know what you may find. □

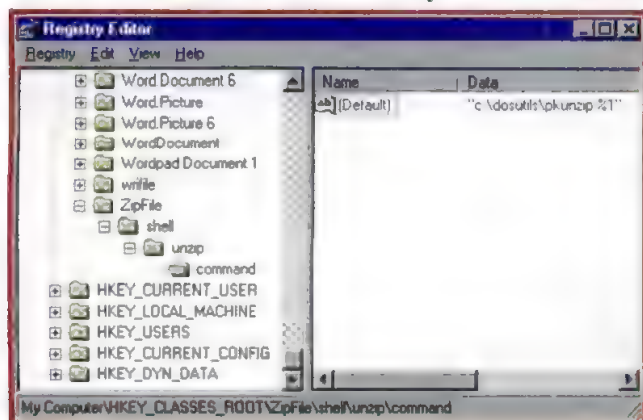
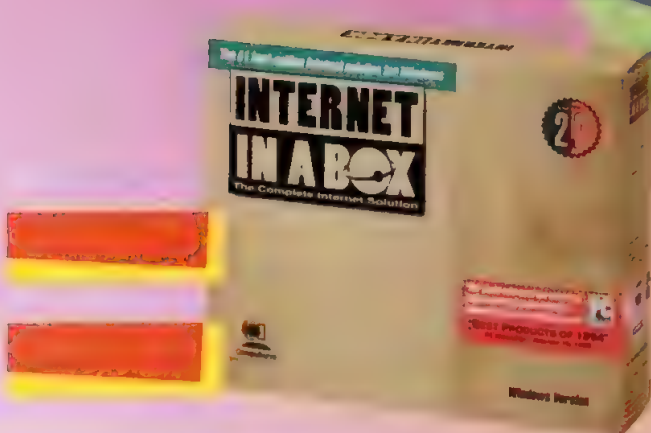


FIGURE 3: This ZipFile subtree under HKEY_CLASSES_ROOT adds an Unzip command to ZipFile context menus.

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CIRCLE 347 ON READER SERVICE CARD



PC Tech/Inside Windows 95

By Richard Hale Shaw

OLE's Component Object Model

COM—the master plan that lets Windows apps interact through OLE.

OLE is Windows' object-linking-and-embedding technology that puts a new form of integration into the hands of end users and developers. As we discussed in the last issue ("Understanding OLE: Application Integration," November 7, 1995), this technology lets end users integrate off-the-shelf applications to create rich documents composed of data from a multitude of sources.

That article explored how you can use an OLE object container like Microsoft Word for Windows to embed or link OLE objects created by an OLE object server like Microsoft Excel. Embedded objects are stored in the container's native data file—which becomes an OLE compound document—and are distributed as part of the file. Linked objects, on the other hand, are stored as physically separate files and the compound document holds only the necessary linkage information. In either case, you can open, display, or print the compound document without the server, but you can't edit the object unless the server is installed. And, of course, you can't edit a linked object from the compound document unless the object is present on your system as well.

But that's traditional object-linking-and-embedding from an end user's perspective. If you're a corporate developer, you need to know more: How do container applications connect to servers to store embedded or linked items? How does a container communicate with a server and get the server to create an instance of an OLE item? And how does OLE make all of this possible? Let's take a look.

THE UNDERPINNINGS OF OLE

OLE is organized as a set of features that can be extended and expanded by Microsoft at any time. As you might guess from the name, the original implementation—OLE 1.0—supported only basic object-linking-and-embedding, using only open editing (where the container and server operate in separate windows). This is still the only way to edit linked objects. OLE 2.0 introduced visual editing (where the container and server share the same window), along with a host of other features: drag-and-drop support, Uniform Data Transfer, Structured

Storage, and OLE Automation.

Now Microsoft has dropped the version numbers entirely and will simply add new features. There won't be an OLE 3.0—or an OLE 95, either. The elimination of versioning is a major enhancement: Versioning is a tremendous problem for those who develop either software components or applications based on these components. Traditionally, a new

ly the same way in the future, but changed or improved OLE functionality in some future release of Windows will not break today's OLE applications. You can take advantage of this in your own applications by, say, designing your OLE server such that a later release will not break older containers.

How can this be possible? The secret is that OLE is designed largely as a set of extensible

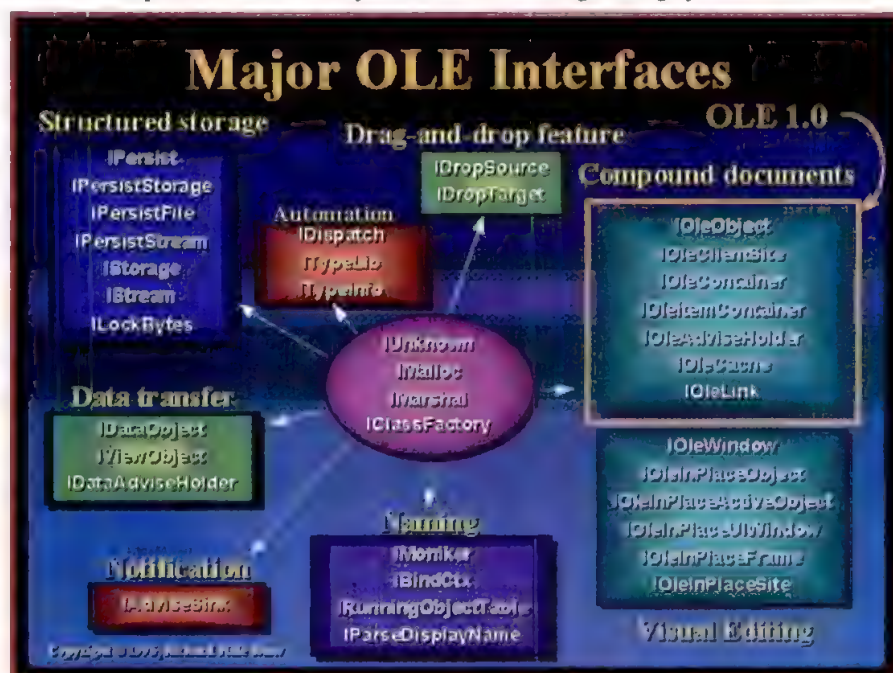


FIGURE 1: OLE's features are designed as a set of interfaces based on the Component Object Model, which describes how OLE applications should interact and behave.

version of either means that the software offers new features and—implicitly—that older features may work differently if they work at all. Behind the scenes, the implication extends to the existing interfaces and functions. Thus if an application uses one version of a component (a special DLL, for example), it can't necessarily assume that the functions it relies on will remain intact in the next version. So each new version of a component implies a new release of the applications that use it.

OLE is designed to eliminate such scenarios, with interfaces that are extensible—but not versioned. Not only will functionality that exists in OLE today continue to work in exact-

C++ classes that specify OLE interfaces (see Figure 1). The use of C++ classes means that the interfaces are strongly typed and that it would be nearly impossible to invoke the wrong one. And C++ classes can be extended in a number of ways, so that extending OLE becomes a matter of defining a new interface that may—or may not—be defined in terms of an existing one. Though written in C++, the interfaces can be used by any Windows programming language

THE COMPONENT OBJECT MODEL

Each of OLE's features is based on a set of these interfaces, with OLE's Component

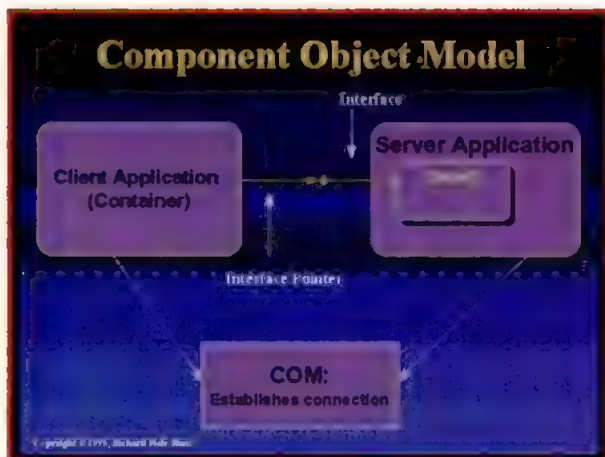


FIGURE 2: OLE's Component Object Model makes it possible for disparate applications to connect and communicate, hiding both the details of the connection and the discrepancies that may exist between releases of the applications involved.

Object Model (COM) at its core. COM prescribes how applications that use OLE will behave and interact, and provides a mechanism for one application to connect to the OLE interfaces supported by another. All OLE components assume that applications using them will do so through COM.

COM's mission is to ensure that disparate Windows applications can connect and communicate through OLE and that the details of the connection remain transparent to the participating applications (Figure 2). The connection between two applications will be made even if the applications are written by different vendors, and if necessary, COM will drop out altogether once the connection is established. Moreover, COM will hide any discrepancies that may exist between different releases of an application, such that a newer release of one application won't cause another application to break as they communicate through OLE.

THE SYSTEM REGISTRY

How does COM connect one component to another? Assume for the moment that you're running Microsoft Word 6.0 or later. You select the Insert | Object command and then Microsoft Graph 5.0 (or whatever version you have). This launches GRAPH5.EXE, an OLE graphic-object server. As soon as you select the object name, Word invokes the server to create a new instance of a graphic object to be inserted into the Word document (Figure 3). MSGraph then takes over Word's interface to begin visual editing.

Under the hood, a series of events have just taken place, all of them via COM: When you select Insert | Object, Word displays the OLE Insert Object common dialog, which scans the system registry for all of the "insertable" objects on your system. If you have MSGraph (installed by all Microsoft Office applications)

on your system, the Insert Object dialog will find its registry entry (Figure 4) and let you embed a graphic object in your Word document.

Among its many functions, the registry acts as the central database that describes all of the OLE objects on a system, providing such necessary information for OLE as the attributes of the objects (some are insertable, some aren't), the commands (or OLE verbs) they support, and the paths to the servers that serve the objects. When you select an object from the Insert Object dialog, the container (in this case, Word) retrieves that object's programmatic ID (in this

case, Microsoft Graph) from the dialog and passes it to the OLE function, CoCreateInstance. OLE then tries to create an instance of the object.

OLE first uses the programmatic ID to find the registry entry for that object. In our example, OLE finds the MSGraph.Chart.5 entry shown in Figure 4. From this registry entry, OLE can easily determine the path to the appropriate object server via the StdFileEditing/server entry. Or it can use the CLSID (class ID) entry—the unique identifier for that server. Using the CLSID as a look-up key, OLE can find a related registry entry with additional information about that server.

This unique identifier—sometimes called a GUID (globally unique identifier, pronounced *goo-id*)—makes it possible to distinguish one server or OLE component from another. GUIDs are 128-bit values formed using a complex algorithm that's encapsulated in an OLE API, CoCreateGuid. The algorithm uses the processor ID of the system where a server is created, the network card ID (if such a card is

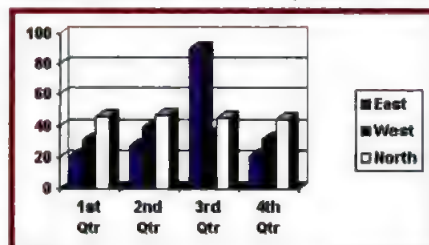


FIGURE 3: The default graphic object created by the MSGraph 5.0 server.

installed), and the date and time. And the algorithm is tuned to prevent collision in the event that more than one thread executing CoCreateGuid calls it on the same system at the same time.

GUIDs are guaranteed to be globally unique on the planet Earth, across space and

time. Sound preposterous? Well, unless some chip cloner starts using the IDs currently found in contemporary CPUs from Intel, Motorola, AMD, and the like, the algorithm used by the OLE APIs (in particular, CoCreateGuid) virtually guarantees uniqueness. And GUIDs don't just identify servers: Every OLE object in a server and each of its interfaces has a unique ID that, when combined with the server's GUID, can uniquely identify each outside of the server as well.

GUIDs are critical to OLE for a number of reasons. First, they provide a unique means of distinguishing every server from every other, preventing the collisions that would occur if only filenames or directory locations (or even both) were used instead. After all, there's no trademark on filenames, and two servers with the same name could exist on the same system. And a GUID separate from the programmatic ID frees users from the need to install the server that originally created the object: If, for example, 1-2-3 was an OLE server for both 1-2-3 objects and Excel objects, it could provide users with an option to replace Excel's GUID with its own, and consequently serve Microsoft Excel 5.0 Worksheet objects.

A quick look at the registry entry for MS-Graph.Chart.5 shows that the CLSID is 00020801-0000-0000-C000-000000000046 (Figure 5). OLE can look up this number and find even more information about the server for this object (Figure 6).

OLE INTERFACES

Once OLE identifies the server, it can invoke the server to create an instance of the object. You'd think this would imply a global OLE function to allocate space for and initialize a server object (like malloc or calloc in C, the new operator in C++, or GlobalAlloc in the Windows API). But each server may need to create and initialize its objects in different ways, and if the server supports more than one type of OLE object, each object may need to be created and initialized differently. So COM requires that each server provide an additional object, or *class factory*, to "manufacture" each object that that server serves (Figure 7).

A container can connect directly to an object's class factory via CoGetObject and get the class factory to create an instance of the objects it manufactures via CreateInstance. Or, the container can call CoCreateInstance, which encapsulates and simplifies the entire process. Once an object's class factory is running, an instance of the object can be created and CoCreateInstance can return. And what does CoCreateInstance return to the calling program? An interface pointer.

OLE interfaces are the heart of the Component Object Model and the key to how programs connect and communicate via OLE. Interfaces are designed as protocols whose use

is specified by COM. For example, to invoke a server to serve an object, a container can call `CoCreateInstance` and receive an interface pointer to the requested object. If the server needs to call back to the container to pass it a metafile or information for storage, it can ask COM for a pointer to one of the container's interfaces. OLE objects can implement multiple interfaces and can query other objects to see which interfaces are supported. Indeed, nearly all of OLE consists of one component retrieving a pointer to an interface in another and then invoking the functionality pointed to by that interface.

OLE's interfaces are specified as C++ structures or classes of pure virtual functions. In C++, a pure virtual function is one that has only a function prototype—but no function body. For example, OLE's `IUnknown` interface is specified as:

```
interface IUnknown
{
    virtual HRESULT QueryInterface(IID&,
    ➤ void**) = 0;
    virtual ULONG AddRef(void) = 0;
    virtual ULONG Release(void) = 0;
};
```

where the keyword `interface` is declared as a C++ structure, and `QueryInterface`, `AddRef`, and `Release` are member functions of `IUnknown`. (In C++, structures, like classes, can contain functions. But, unlike in classes where all members are private and unavailable to the outside world, in a C++ structure functions are public and available to the outside world, by default.) The C++ syntax

```
virtual return_type
➤ function_name(args...) = 0;
```

specifies a pure virtual function with a specific return value and set of arguments, but whose implementation is not supplied. The only way to implement such a function is by deriving a new class from the original and then providing the function's implementation in the derived class. Indeed, C++ won't let you create an instance of a class that contains pure virtuals: You can only instantiate a derived class if the new class supplies implementations of the pure virtuals it inherits.

Because these functions have no implementation in OLE, an OLE server must provide the implementation in each of its objects that support `IUnknown`. Thus, a great part of OLE programming consists of choosing interfaces to support and providing the implemen-

tations of those interfaces. And unless you use a programming tool like Visual Basic or an application framework like Visual C++'s Microsoft Foundation Classes, which provides implementations of core OLE interfaces, you'll have to implement them yourself.

Among OLE interfaces, `IUnknown` is special. Considered the gateway to other interfaces, an object's `IUnknown` interface is its means of providing access to all of the other interfaces the object implements. Thus, what's returned by a successful call to `CoCreateInstance` is a pointer to the newly created object's `IUnknown` interface. Via this interface

object. Even `CoCreateInstance` works this way: It uses COM to retrieve an interface pointer to an object's class factory and then invokes the class factory to create an instance of the supported object.

CONNECTING COMPONENTS

It is through OLE interfaces that COM connects an OLE container and server—regardless of how the server is implemented. For example, COM lets you connect a container to a DLL-based server (known as an in-process or in-proc server). Because the server is DLL-based, it runs in the address space of the container, and

interface pointers in either component can reference functionality in the other directly. Thus, both container and server can use each other's interfaces as pointers to functionality in the same address space.

But what happens when you invoke an EXE-based (or out-of-process) server? Interface pointers, like regular function pointers, are contextual according to the address space they originate in: They're valid only in that address space and not in another. If a server is EXE-based, it runs in its own address space, and the container can't just invoke its interface functions in the same way as when

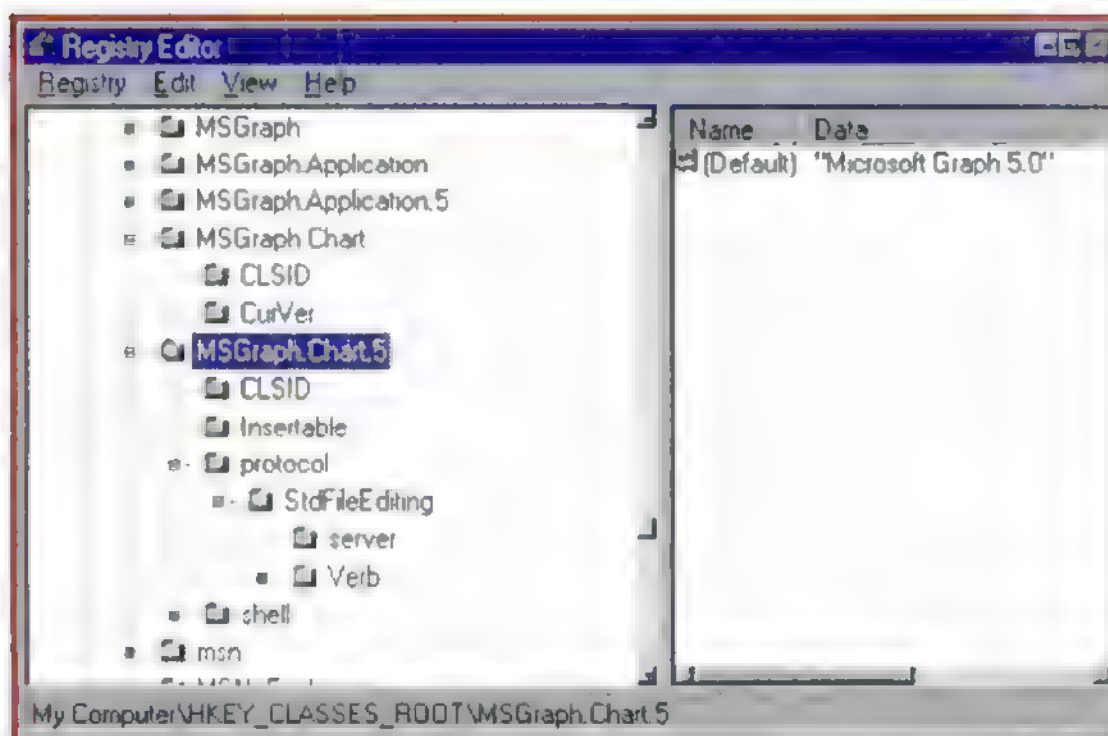


FIGURE 4: The registry entry for the MSGraph 5.0 Chart object.

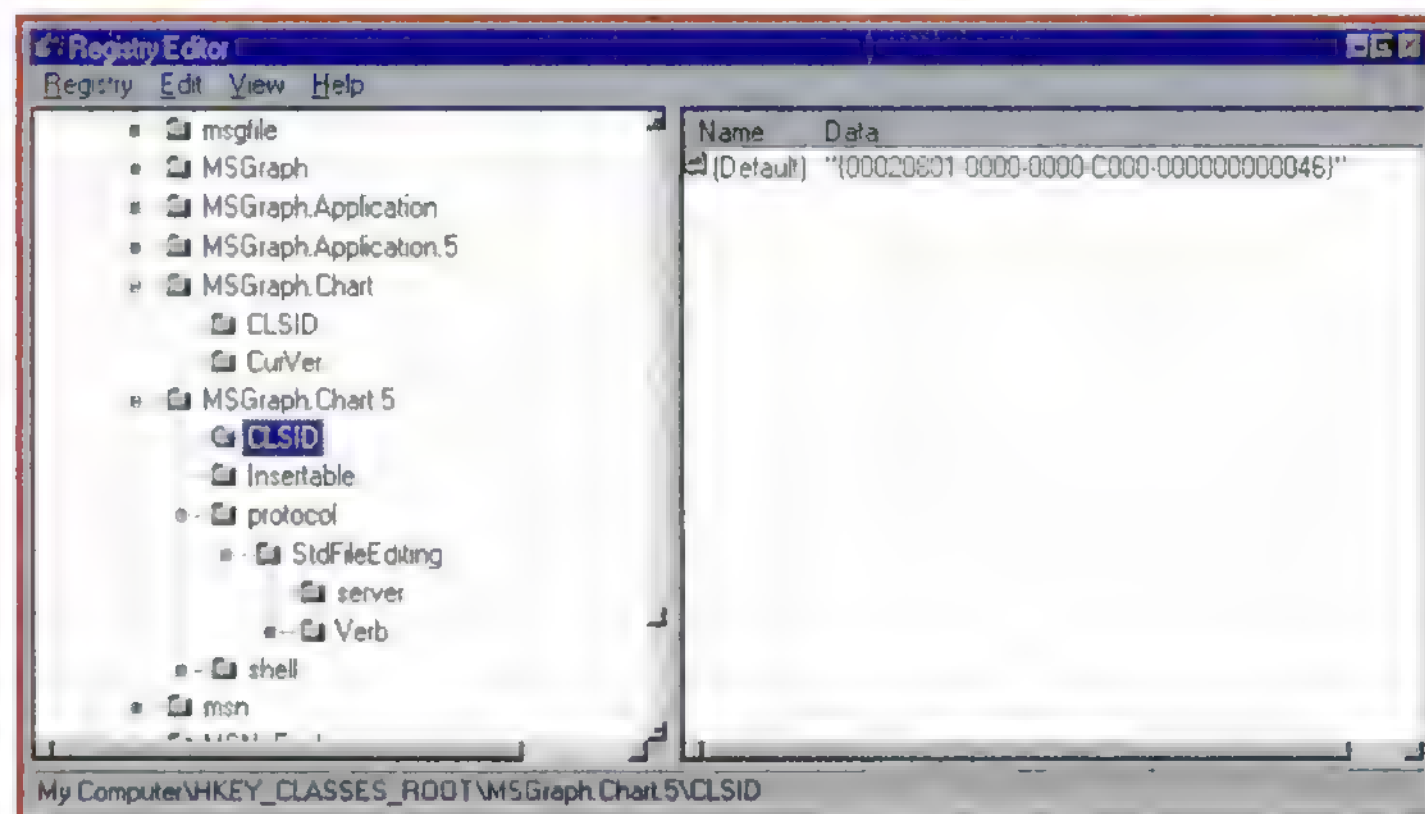


FIGURE 5: Using the programmatic ID as a look-up key, OLE can find the GUID or CLSID for the object's server (in this case, `MSGraph.Chart.5`).

pointer, a container can call `IUnknown::QueryInterface`, pass it the interface IDs of other OLE interfaces it wants to access in the server object, and receive pointers to those interfaces if they're implemented by that object.

The same scenario is played over and over in OLE: get a pointer to an object's `IUnknown`, query the object to get a pointer to another interface, and then use that pointer to invoke functionality implemented by the

accessing a DLL-based server. To accommodate EXE-based servers—and even servers that run on other systems across a network—COM implements what's known as a *proxy-stub* pair (Figure 8).

A *proxy* is a layer of functionality, implemented by COM, that runs in the address space of a container and represents a server's interfaces to the container; a *stub* represents a container and runs in the address space of the

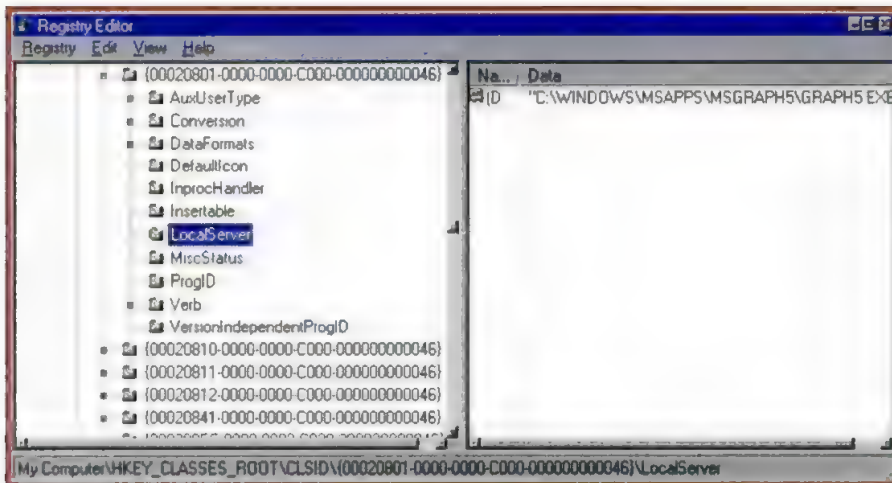


FIGURE 6: The CLSID (class ID) registry entry uniquely identifies a particular server, and the CLSID section of the registry provides even more information about that server.

server. A container can access the interfaces in a server via the proxy. The container thinks it's accessing the server-object's interface pointers directly, when it's actually accessing the proxy. COM makes remote procedure calls (RPC) between the proxy (in the container's address space) and the stub (in the server's address space) to connect the container to the server-object's interface functions. And COM also marshals (that is, passes across process boundaries) the interface pointers and parameters between the two address spaces to ensure that they're useful in both address-space contexts.

The reverse occurs if the server needs to access an interface function in the container: The server accesses the stub, which COM connects to the proxy and thus to functionality in the container. (This scenario applies to OLE automation clients and servers as well.)

The beauty of the scenario is that the container and server need never know that the

other is operating in a different address space. A container can use an in-proc server the same way that it uses an out-of-process server—the details of the connections are hidden by COM. And, once Microsoft adds Distributed OLE to Windows, the proxy-stub pair will also serve to connect containers and servers operating on disparate systems connected via a network. In that case, COM will create an RPC connection between proxy-stub pairs that reside on separate, networked machines. Of course, this functionality isn't in place yet. So while you can use both DLL- and EXE-based servers from a container on the same machine, you can't yet utilize containers and servers that run on different machines.

COMING UP: BUILDING OLE APPS

When a container calls CoCreateInstance to invoke an object server and create an instance of a particular object, the function returns a pointer to the object's IUnknown interface.

The container can then call QueryInterface to retrieve pointers to other OLE interfaces implemented by that object, allowing the server to take over the main window and interface of the container to support visual editing of the object (assuming it's an embedded object). But how does a developer know what OLE interfaces to implement and when?

That's a fairly messy topic: Writing OLE applications in either C (OLE supplies macros for using C to implement and access interfaces) or C++ is a complex process of learning the OLE interfaces, choosing which ones to implement, and then implementing them correctly. Of course, you can reuse pieces of code from one OLE application in another, but you may spend more time trying to prepare your code for reuse than you do creating the application itself. Luckily, a number of popular development tools (Borland C++, Visual C++, Visual Basic, and others) provide large-scale implementations of commonly used OLE interfaces. With Visual Basic, you get an encapsulation of OLE that fits nicely into VB's event-driven paradigm. While the performance of VB is never as good as with a compiled language, it requires very little on your part to create containers and servers. With C++ application frameworks like Visual C++ and the Microsoft Foundation Classes, you need to know more about how to create OLE applications than with VB. But the performance of C++ executable code is excellent, and C++'s extensibility makes it possible to apply MFC's implementation of OLE to a wide variety of containers and servers.

In the next column, we'll discuss how you can use these tools to build new OLE containers and servers, as well as how to add OLE capabilities to existing Windows applications. □

Richard Hale Shaw is a contributing editor of PC Magazine.

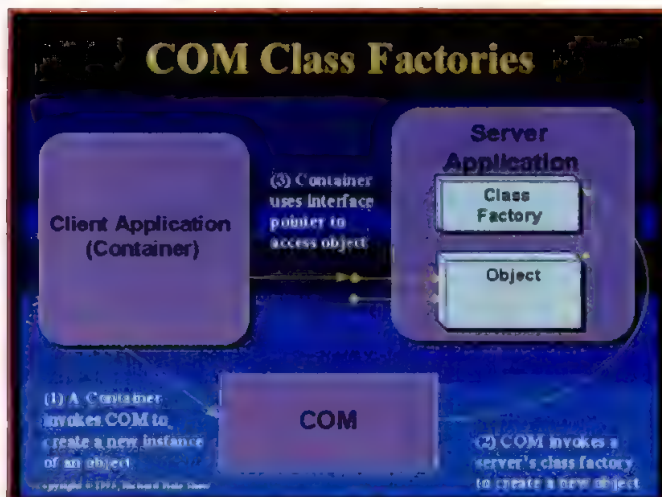


FIGURE 7: COM expects every server to provide a class factory for each object served; the class factory is responsible for manufacturing (creating instances of) each object.

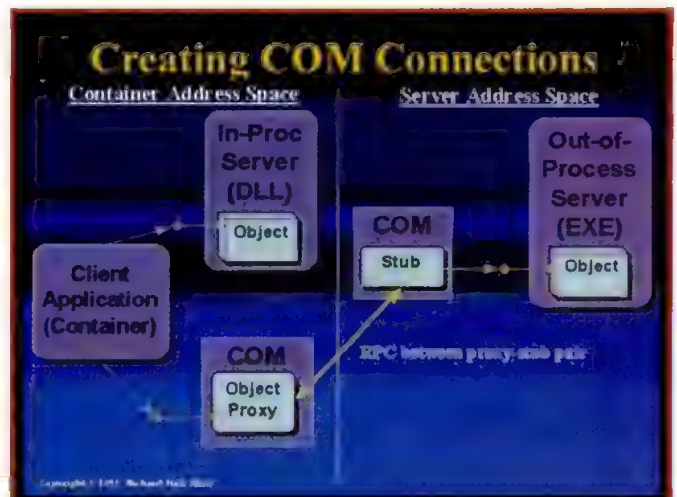
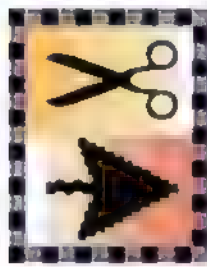


FIGURE 8: COM makes it possible for EXE-based containers and servers to communicate—even though they run in separate address spaces—via a proxy-stub pair.



PC Tech/Utilities

By Jonathan Waldman and Jack R. Heath

Create Puzzles with WordJunction

A Visual Basic application that's both entertaining and educational.

We thought it was time for the Utilities column to lighten up a little, so this time we give you a game! WordJunction creates crossword and word-find puzzles—blocks of letters with hidden words. You can use it to prepare vocabulary study aids for students or to create custom puzzles for special events or greeting cards.

WordJunction places words from a list that you create into a grid of dimensions that you specify, so that every word in the grid intersects at least one other word. Two puzzle styles are supported: crossword and word find. Multiple puzzles can be created from a single word list, and each puzzle can be saved to and loaded from disk for future reference. Finally, you can print puzzles and solutions for distribution to others.

You can obtain WordJunction by downloading its files from PC Magazine Online or by mail (for details, see the sidebar "Guide to Our Utilities"). WordJunction was written using Visual Basic 3.0, Professional Edition. Original artwork on the program's splash screen was created using Corel Draw 5.

USING WORDJUNCTION

To install WordJunction, copy the program files WJ.EXE and WJ.HLP to a subdirectory. In Windows 3.1, use Program Manager to create an icon for WordJunction; in Windows 95, create a shortcut.

Five Visual Basic support files need to be in your Windows SYSTEM directory to run WordJunction: THREE.DLL, CMDIALOG.VBX, SPIN.VBX, MSAFINX.DLL, and VBRUN300.DLL. If you don't already have these files or if the versions you have are older than those used by WordJunction, copy the support files to your Windows SYSTEM directory.

One final installation note: The standard Windows TrueType font Courier New must be on your system for WordJunction to work properly. If the font is missing, you may get an "Invalid Property" error. To replace a missing font, use the Fonts selection in Control Panel. Courier New is available on your Windows distribution disks or CD-ROM.

When you launch WordJunction, you will see its Main screen (see Figure 1). The options buttons at the upper-right quadrant of this screen guide you through the steps required

to generate a puzzle. Step 1, which is selected by default, lets you retrieve words from a word-clue file. Select Step 2 to alter the appearance of the puzzle in the Viewport. The remaining two steps let you set advanced options and save or print a puzzle. We'll discuss each step sequentially.

Step 1 lets you load a word-clue file. Click Get Words and select SAMPLE.WRD to load the sample word-clue file. The status bar displays such information as the name of the word-clue file you chose, along with the total number of words loaded. The spin control labeled Word Number In Word-Clue File lets you browse through the words and their asso-

ciated clues. Step 1, which is selected by default, lets you retrieve words from a word-clue file. Select Step 2 to alter the appearance of the puzzle in the Viewport. The remaining two steps let you set advanced options and save or print a puzzle. We'll discuss each step sequentially.

If you choose Select Matches Randomly, then crosses within a word are tried randomly rather than sequentially. (The way WordJunction selects "matches" is discussed more thoroughly later.) If you check both options (the default), generated puzzles are the most random and thus the least predictable.

Choosing Starting Word tells WordJunction which word to try to place first when creating a puzzle. Choosing a different seed word will often create a different puzzle. Choose <RANDOM> to let WordJunction select one itself. The Tries option lets you tell WordJunction how many times it should create a puzzle with this word list. Depending on the word order and other options, the number of words that make it into the puzzle will vary. If Tries is set to a number greater than 1, WordJunction keeps track of the solution that contains the greatest number of words. You abort the process at any time by pressing the Stop button. WordJunction will then display the best puzzle created up to that point. If you don't stop the process, WordJunction will continue to try solutions until it has tried the number of times you specify. The status bar in the lower-right corner displays the percentage of the total number of tries that has been attempted.

Finally, selecting Step 4 displays options that let you generate, save, and print the puzzles. To generate a puzzle, click the Generate Puzzle button. A puzzle will soon appear in WordJunction's Viewport (see Figure 4). After experimenting with various options, you may want to save or print the puzzle. You can save puzzles by clicking the Save As... button. You should always save the puzzle to a file with a .CW extension. Previously saved puzzles are retrieved using the Load button. To protect the integrity of a loaded puzzle, WordJunction doesn't let you generate new puzzles when the puzzle in the Viewport is one you've previously saved. To generate new

IN THIS ISSUE

WordJunction

WordJunction creates crossword and word-find puzzles. Use it to prepare vocabulary study aids for students or to create custom puzzles for special events or greeting cards.



ciated clues. To jump to a particular word, you can enter the word number directly and press Enter.

To proceed to Step 2, click the Step 2 radio button or press Alt-2. The options box in the center will display a new set of controls that let you set the appearance of the puzzle (see Figure 2). The spin control labeled Maximum Squares Per Side lets you set the maximum grid size. You can choose any number from 2 to 24. WordJunction will not exceed the size you specify, but it may use a smaller size.

A set of radio buttons lets you select the puzzle style: word find or crossword. If you select crossword, the Solid Square Color button is activated, letting you select the color of squares without letters.

Step 3 lets you modify Advanced Settings (see Figure 3). If you check Select Words Randomly, then WordJunction will attempt to

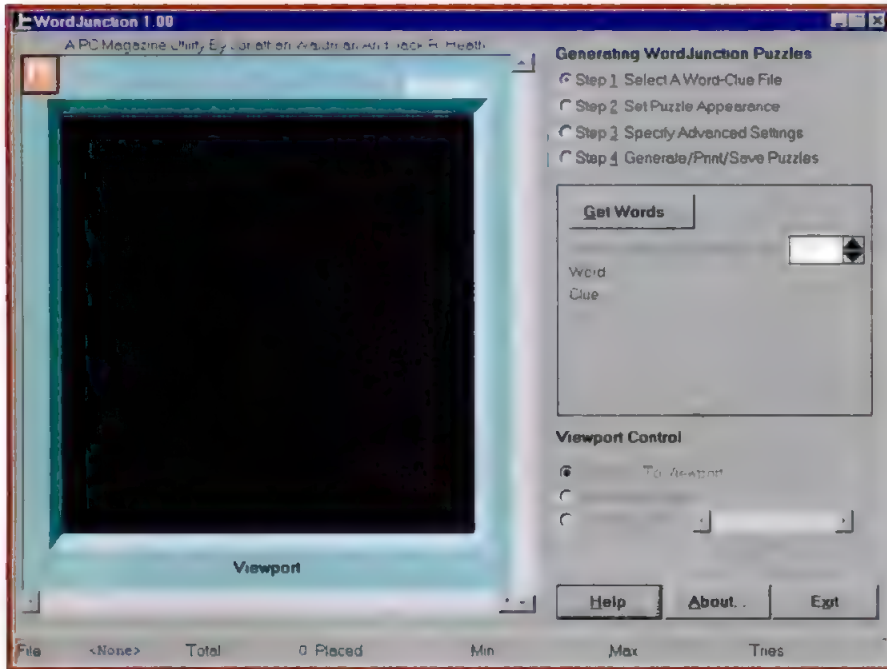


FIGURE 1: When you first launch WordJunction, the Step 1 radio button is selected and the Get Words button is displayed.

puzzles, always use the Get Words button (Step 1), then click Generate (Step 4).

Pressing the Print button presents a dialog box (see Figure 5) that contains three check boxes and, for crossword-style puzzles, two option buttons. Check Fit Puzzle To Page to print the largest puzzle possible. The option buttons let you specify whether to use gray for the solid-square color or (if you have a color printer) to use the custom color you specified in Step 2. Check Print Clues if you want a list of clues. Check Print Answers if you want to show the solution to the printed puzzle. Printing puzzles without answers lets you give the puzzle to someone else to solve.

Unlike printed puzzles, screen-rendered puzzles are always solved. You can manipulate the image of the puzzle in the Viewport in a number of ways. Choose Fit Puzzle to Viewport to scale the puzzle so that it is contained entirely within the Viewport. Choose Show Actual Size to render the puzzle at its actual (printed) size. Choose Custom Zoom to zoom the Viewport in or out. A horizontal scroll bar controls the percentage zoom. For example, if you want to see the puzzle at 50 percent of its actual size, slide the horizontal scroll bar until it reads 50%. Click the Help button for on-line help on any topic.

Before too long, you're probably going to want to create your own word lists and clues. WordJunction requires this information to be stored in a text file named with a file extension of .WRD. Any text editor, such as Windows' Notepad applet, can be used to create the word-clue file. The sample .WRD file included with WordJunction shows the required for-

mat. Here's an excerpt from SAMPLE.WRD:

```
CARDIOLOGIST
physician specializing in the heart
➔and blood vessels
NEUROLOGIST
physician specializing in the brain
➔and nervous system
PEDIATRICIAN
physician specializing in the care of
➔children
```

Notice that the first line contains a word, and the second line contains the clue for that word. This pattern is repeated throughout the word-clue file so that all odd rows have a word and all even rows contain a clue for the word that immediately precedes it. Words can contain up to 24 characters and are automatically converted to uppercase and stripped of leading or trailing spaces. Clues can contain up to 80 characters and can contain mixed-case characters and punctuation.

The number of words that can appear in a word-clue file is limited to available memory. We suggest that you restrict your lists to a few dozen words. There's no practical limit to the number of words you can supply, but you should realize that larger lists will slow the speed with which WordJunction can create a solution. The reason is that every word in a word-clue list must be processed at least once before a solution is returned.

INSIDE WORDJUNCTION

One of WordJunction's tasks is to create a solution; another is to display it. Because

these tasks are truly discrete, they are contained in two separate Visual Basic modules. The first is the Solver routine (SOLVER.BAS), which creates a solution, and the second is WordJunction (WJ.BAS), which presents a user interface and displays or prints a solution. Not only did this approach make it easier for two developers to write WordJunction, but it also allowed us to optimize the modules separately.

CREATING THE SOLUTION

The CreatePuzzle function controls how Solver develops a solution by setting such parameters as the maximum size of the grid, the starting word, the order in which words are selected for testing, and the order in which letter matches within a word are tested. If you vary these parameters, many different solutions can be developed for the same word list.

The Solver routine attempts to place as many words as possible into the cells of a grid, with the constraint that each word must be connected to at least one other by a shared letter. The process consists of three basic steps—selection, testing, and placement—repeated many times.

WordJunction begins by placing the starting word into an empty grid. No testing is required for the first word. New words are then selected from the word list until one is found that contains a letter that matches a letter in a

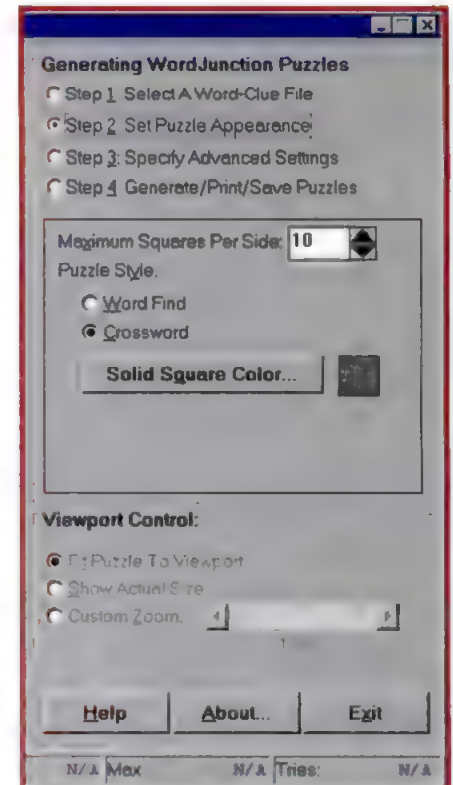


FIGURE 2: Select the Step 2 radio button after selecting the word list to choose the puzzle's size and style.

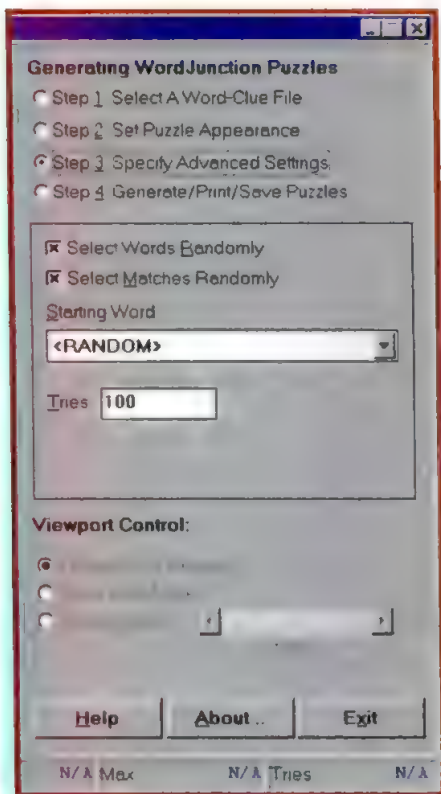


FIGURE 3: The Advanced Settings in Step 3 let you control WordJunction's puzzle-generation algorithm.

word already in the grid. When a letter match is found, the new word is tested to see whether there's a place to put it in the grid. If so, the new word is placed into the grid at a right angle to the word with the matching letter so that it crosses that word at the matching letter. The process of selecting, testing, and placing words continues until no more words can be placed into the grid. The result is a grid partially filled with words in the pattern of a word puzzle.

For efficiency, the algorithm keeps track of what has been tested and never tests the same matching letters in a pair of words twice. To do this, we first create a list of every letter match found in every pair of words. The selection step is then reduced to selecting words with untested letter matches from this list, instead of repeatedly searching entire words for letter matches. Once a letter match has been tested, it's flagged so that it's never again selected for testing.

Solver is implemented as a function with three arguments:

```
Function Solver (Word() As String,  
    Solution() As typeSolution, Args As  
    typeArgs) As Integer.
```

The function returns True if it is able to place the new word into the grid. If it cannot, the function returns False and an error message is

placed in the Args argument.

The Word array, which contains all the words from the word-clue file, is passed to Solver. Each array element contains a single word. The Solution array returns a single solution found by Solver. Each element of the one-dimensional Solution array is a structure that contains the starting column and row for an across word, a down word, or both. The structure is shown in Figure 6.

AcrossWord and DownWord are indices into the Word array. The index to an element in the Solution array is the number that actually appears for a word in the puzzle.

The lists of across words and down words are combined in the same array because they share the same numbering sequence in the puzzle. If an across word starts in the same grid cell as a down word, they both have the same number in the puzzle. The elements are sorted by column and row to match the manner in which crossword puzzles are numbered. The individual elements of Args are described in detail in the declarations section of the SOLVER code module.

Solver begins by creating the one-dimensional Match array—a list of every letter match found in every pair of words. This is done by comparing every letter of every word with every letter of every other word. The information is saved in the structure shown in Figure 7.

One Match element is created for every letter in a word with a matching letter found in a second word. For example, the word FOG will have a set of three Match elements created for the word GOOD—one for the G letter match, and one for each of the two O

letter matches. If GOOD is the fourteenth element in the Word array, then the Match element for the G match will have Ltr1Posn equal to 3, Word2Idx equal to 14, and Ltr2Posn equal to 1.

The word FOG may also have many more Match elements created for matching letters in other words. The word GOOD will have a separate set of three Match elements created for the same three matching letters in the word FOG. But only one set of Match elements is ever tested for any pair of words. Which set is used depends on which word is placed into the grid first.

As demonstrated, more than one Match element can be created for a given word. The one-dimensional WordMatch array is created along with the Match array in order to store this one-to-many relationship. The format is shown in Figure 8.

By design, all of the Match elements for a single word are in contiguous array positions, so only the first and last array indices need to be stored in a WordMatch element. For example, if the word FOG is the third element in the Word array, then the third element of the WordMatch array will contain the index to the first Match array element for FOG and the index to the last Match array element for FOG.

Next, Solver creates the empty two-dimensional Grid array for storing letters by their column and row position in the puzzle solution. Grid is used to quickly test whether the placement of a new word will conflict with any words that have already been placed into the puzzle.

Solver now starts the repetitive process of

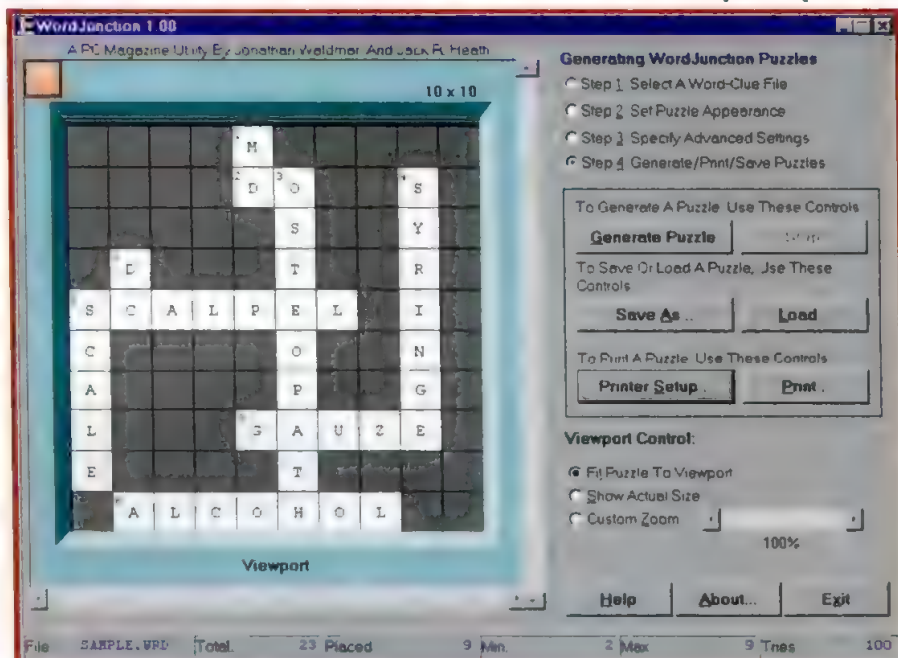


FIGURE 4: After selecting the word list and options, press the Generate Puzzle button in Step 4 and the puzzle will be displayed in the Viewport.

selection, testing, and placement. If the optional first word index has been passed to Solver (the Starting Word combo box), this index is used to select the starting word for the puzzle. Otherwise, the first word is selected using the first part of the selection step described below. The starting word may not end up corresponding to Clue 1, but it is the first word placed into the grid. Note that the testing step is always skipped for this first word.

The selection step has two parts and uses the list of letter matches created earlier. The first part selects a new word with at least one letter match that hasn't been tested yet. The second part selects an untested letter that matches a letter in a word already in Grid. If none of the word's untested letters matches a word in Grid, the selection step starts over.

In the testing step, each letter of the new word is compared with letters already in Grid cells to be occupied by the new word. If any of these cells contain letters that don't match the new word, the testing step fails.

Also, all cells adjacent to the new word must be empty or contain letters from a word that intersects the new word at a right angle. If the testing step fails, processing continues with part two of the selection step.

Letters from words that pass the testing step are placed into the grid. A Vector array is also updated with each word's location in the grid and inserted in a linked list sorted by column and row. The one-dimensional Vector array (Figure 9) contains a corresponding element for each element in the Word array and is used as the intermediate step toward generating the Solution array.

Since the Solution array must be sorted by row and column, elements in the Vector array are linked in that order to save time later. Using a linked list permits sorting array elements without actually moving them around in the array. The index to the Vector element at the end of the linked list is stored in the LinkEnd variable, and the index to the next element in the list is stored in each Vector element. The list position of each new Vector element is determined by comparing the row and column of the new element to those of each other element starting at the LinkEnd index, and walking through the list until a lower row or column in the same row is encountered.

The processing cycle then begins again with part one of the selection step. When there are no more words with untested letter matches,

Solver copies the word locations in the Vector array into the Solution array in column and row order by walking through the linked list described above.

DISPLAYING THE SOLUTION

Having finished our discussion of SOLVER.BAS, we will now move on to WordJunction's interface code, contained in WJ.BAS and MAIN.FRM. WordJunction's solutions are directed to either the screen's Viewport or to the printer. Because users will be running

Visual Basic design mode, you can confirm that a control is a child of another when you are unable to drag it outside the parent control's border.) These three picture box controls are used to create the illusion of a Viewport window through which a puzzle solution may be viewed. Note that the picViewport control serves an aesthetic function only—it merely frames the displayed solution. Let's examine further how picPuzzleContainer and picPuzzle work together.

WordJunction lets you display the puzzle in

one of three ways. When you select Fit Puzzle To Viewport, WordJunction sets the width and height properties of picPuzzle to be equal to those of picPuzzleContainer. Since the two picture controls are the same size, neither scroll bar is enabled. When the display option is set to either Show Actual Size or Custom Zoom, the picPuzzle child may be smaller or larger than its picPuzzleContainer parent. If it is smaller, then it is centered within the picPuzzleContainer control and both scroll bars remain in-

active. If it is larger, then the vertical and horizontal scroll bars are activated.

To create the illusion of the puzzle being panned in the Viewport, each scroll bar is set to a range from zero to an uppermost value. This uppermost value, contained in a scroll bar's Max property, represents the height or width difference between picPuzzle and picPuzzleContainer. For instance, the horizontal scroll bar is set to the difference in the width of picPuzzle and picPuzzleContainer. This way, moving the horizontal scroll bar changes the left offset of picPuzzle. When the horizontal scroll bar's Max value has been reached, it means that picPuzzle's rightmost edge can be seen within picPuzzleContainer. A similar technique applies to the vertical scroll bar, where the top offset of picPuzzle is being adjusted.

Whether to enable the scroll bars is determined by checking to see if the calculated Max value is greater than zero on either the horizontal or the vertical axis. The picPuzzle con-

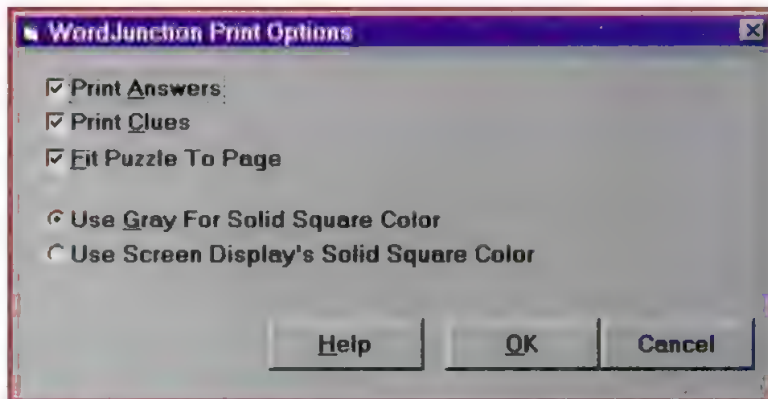


FIGURE 5: WordJunction's Print Options let you control the appearance of the printed puzzle and choose whether to print answers, clues, or both.

systems with various screen and printer resolutions, WordJunction uses a resolution-independent coordinate system. Rendering puzzles successfully across different hardware requires an understanding of picture controls, coordinate systems, and the Line method.

The Viewport lets you see the WordJunction puzzle. If the puzzle is scaled in such a way that it is entirely visible, then the puzzle is centered within the Viewport window. If the puzzle is too large to be seen in its entirety, then scroll bars are added, and you can pan the puzzle left and right or up and down. This feature is implemented with nested picture box controls. Here's how it works.

The Main Screen's Viewport consists of three picture box controls. The first, called picViewport, contains a metafile graphic showing a stylized cyan border. The control picPuzzleContainer is placed on top of this control to confine the other controls within its borders. The third picture box, picPuzzle, is a child control within picPuzzleContainer. (In

```
' Array element structure of Solution() argument (returned from Solver):
Type typeSolution
  AcrossWord As Integer      ' Index in Word() if across word starts at Col/Row.
  DownWord As Integer        ' Index in Word() if down word starts at Col/Row.
  Col As Integer              ' Starting column for word.
  Row As Integer              ' Starting row for word.
End Type
```

FIGURE 6: Each element of the Solution array is a structure that contains the starting column and row for an across word, a down word, or both.


```

Rem Match() element structure. One letter match between a pair of words.
Type typeMatch
    Ltr1Posn As Integer    ' Position of matching letter in Word1
    Word2Idx As Integer    ' Index of Word2 in Word().
    Ltr2Posn As Integer    ' Position of matching letter in Word2.
End Type

Rem Array of all letter matches between every pair of words.
Dim Match() As typeMatch

Rem Array with one tested flag for each element in Match().
Dim MatchTested() As Integer

```

FIGURE 7: The structure shown here is used by WordJunction to store the letter matches found in every pair of words.

```

Rem WordMatch element structure. Range of indices in Match().
Type typeWordMatch
    FirstMatch As Integer    ' Index of first Match() element for Word1.
    LastMatch As Integer     ' Index of last Match() element for Word1.
End Type

Rem Array with one range of indices for each word in Word().
Dim WordMatch() As typeWordMatch

```

FIGURE 8: The WordMatch array shown here stores the Match information for each word.

trol is always a square and so is picPuzzleContainer, so it is true that if one scroll bar is activated, then so is the other. Once the scroll bars are activated, they are able to move the puzzle around in the Viewport by changing picPuzzle's Left and Top properties. Clicking an arrow pans the puzzle one crossword square at a time, while clicking between an arrow and the scroll bar elevator pans one screenful (the size of the picPuzzleParent control) at a time.

So that's how the puzzle appears to move within the Viewport window. Rendering the puzzle itself requires WordJunction to draw a grid of squares onto the picPuzzle control. All squares are drawn using picPuzzle's Line method, which is able to render filled-in or hollow rectangles. The Line method has two advantages. First, it is able to render graphics reliably using a resolution-independent coordinate system. Second, it is a graphics method that draws by placing pixels onto a device context (an area of memory). Unlike Visual Basic's picture box control, for example, the line method will not diminish available Windows resources, because it does not create an object that requires a Windows handle. We are able to take this approach because each square in a puzzle does not need to be treated as an object by the user. If the user needs to resize or drag individual squares, then it is better to render each square using the picture box control.

Drawing with the line method requires an understanding of units of measurement. WordJunction's height and width coordinate values are expressed in units of measure called

twips. A twip is 1/20 of a printer's point ("twi" comes from twentieth and "p" comes from point). A printer's point is 1/72 of a logical inch (a resolution-independent unit of measurement), so a twip is 1/1440 of a logical inch. An object measuring 1,440 twips will be exactly 1 inch when printed. It may not necessarily be 1 inch when displayed on the screen, but it will be in the correct proportions—not stretched vertically or horizontally.

Horizontal or vertical distortion occurs when an object is displayed at a resolution different from the one used to create it. Since screen and printer resolutions are almost always scaled differently, twips must be used as the unit of measurement when an image needs to display correctly on both devices. Without a resolution-independent unit of measurement, you would have to use separate line-draw techniques for the screen

```

Rem Intermediate solution vector.
Type typeWordVector
    Col As Integer    ' Starting column index in Grid() for word.
    Row As Integer    ' Starting row index in Grid() for word.
    Direction As Integer ' Direction of word in Grid() - across/down.
    Link As Integer    ' Index to next Vector() element in row/col sort.
End Type

Rem Array with one vector for each word in Word().
Dim Vector() As typeWordVector

Dim LinkEnd As Integer    ' Index of Vector element at end of linked list.

```

FIGURE 9: The Vector array shown here is used to store each word's location in the grid.

and the printer.

WordJunction uses the ScaleMode property to set the coordinate systems of both picPuzzleContainer and picPuzzle to twips. Doing this lets WordJunction furnish the arguments for the Line method of the picPuzzleContainer and picPuzzle control in twips. Other available units of measurement include pixels, points, characters, inches, millimeters, and centimeters. Only twips give the advantage of letting the programmer use integer-only values, however, making twips immune to the rounding errors introduced when inches are used, for example.

WordJunction draws a hairline black border around its squares when displaying crossword-style puzzles. It also draws solid (filled-in) squares. Both square types are drawn using Visual Basic's Line method. The Line method is available on non-MDI forms, picture box controls, and the Printer object. In all cases, the object's CurrentX and CurrentY properties determine the left and top offset, respectively, of the graphic element drawn by the Line method. Setting the object's FillStyle to TRANSPARENT creates an open square, or border.

At its simplest, the Line function draws a line from the current position (indicated by CurrentX and CurrentY) to a specified point. Adding Step before the point argument causes Line to treat the coordinates as relative to the starting point.

The Line function also accepts specific starting coordinates, again with the optional Step meaning that this point is relative to the current position. An optional color argument controls the line's color. Finally, a B argument at the end causes Line to draw a box; the box's upper-left corner is the starting point, and its lower-right corner is the end point. Adding an F causes the box to be filled.

WordJunction uses the Step option, so the second pair of coordinates is interpreted as an offset from the first pair. This offset is equal to Puzzle.SquareSize, which expresses the size of an individual puzzle square in terms of twips.

For crossword-style puzzles, WordJunction uses the constant BLACK to outline each

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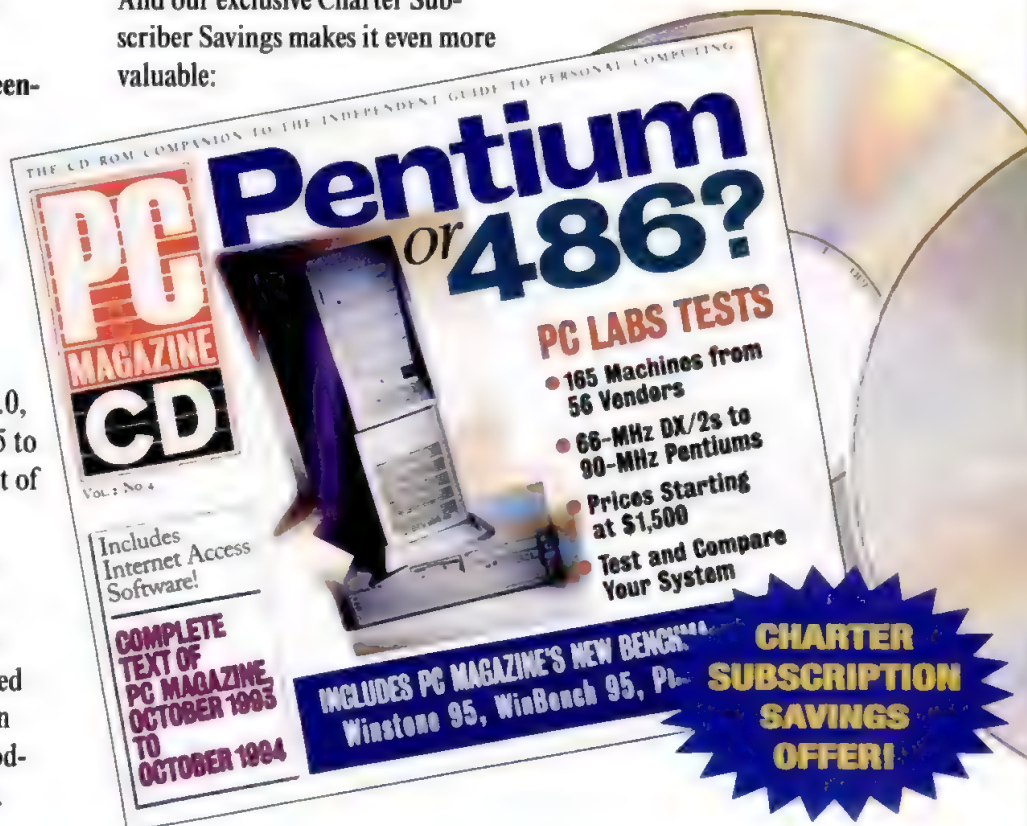
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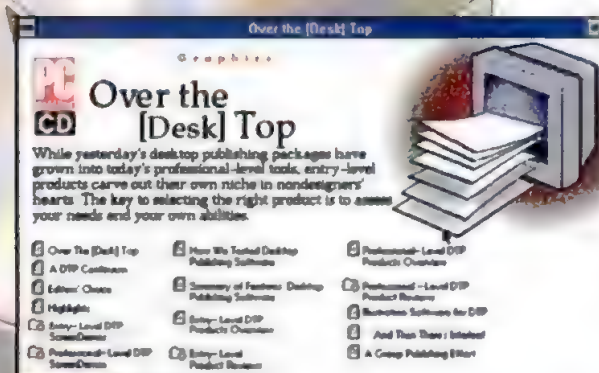
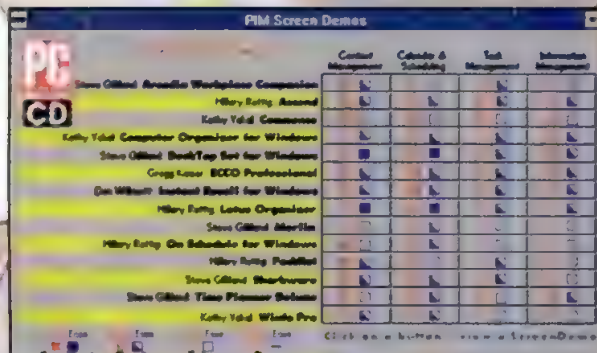
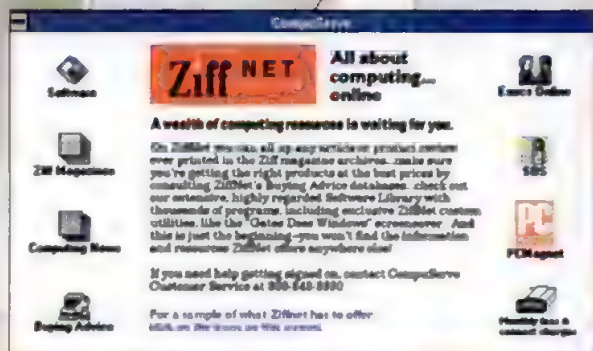


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square and Puzzle .SquareFillColor (the custom color chosen in Step 2) to fill those squares that won't contain a letter. Those squares that do contain letters are filled using the color value contained in the global constant WHITE. Word Find puzzle squares lack a black border and are always filled white.

An unfortunate side effect of drawing graphics onto a picture control is that the graphic will be erased when another window is placed over it and then removed. The AutoRedraw property can be set to True for picture box controls, but setting AutoRedraw requires that the picture control image be saved to memory. Large picture box images may cause an undesired depletion of re-

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- 8 **FINDIR** Analyzes IRQ lines
- 9 **WINCMD** Command file interpreter
- 10 **SCHED** Runs programs automatically

sources, which could lead to an "Out of Memory" error. To reduce this possibility, picPuzzle's AutoRedraw is set to False, and WordJunction redisplay the puzzle whenever the picPuzzle's Paint event is trapped. This approach saves memory, but also requires that the entire puzzle be redrawn whenever it has been occluded by another Windows window, or whenever it needs to be refreshed or scaled. This behavior may irritate some users

of puzzles WordJunction can create is limited only by your inventiveness. □

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GUIDE TO OUR UTILITIES

ABOUT WORDJUNCTION...

DESCRIPTION WordJunction creates crossword and word-find puzzles. It can be used to prepare vocabulary study aids for students or to create custom puzzles for special events or greeting cards.

USAGE To install WordJunction, copy the program files WJ.EXE and WJ.HLP to a subdirectory. In Windows 3.1, use Program Manager to create an icon for WordJunction; in Windows 95, create a shortcut. Five Visual Basic support files need to be in your Windows SYSTEM directory to run WordJunction: THREEED.VBX, CMDIALOG.VBX, SPIN.VBX, MSAFINX.DLL, and VBRUN300.DLL. Note: The standard Windows TrueType font Courier New must be on your system for WordJunction to work properly.

There are four steps to creating a WordJunction puzzle. When you first launch WordJunction, the Step 1 radio button will be selected and the Get Words button will be displayed in the central options area. Press Get Words to select a word-clue file. A sample word-clue file is included with WordJunction. To create your own, use any text editor (for example, the Windows NotePad applet) and follow the format used in SAMPLE.WRD.

Next choose the Step 2 radio button to select options that control the puzzle appearance and type. Step 3 offers advanced options that affect how the words are put together into a puzzle. Step 4 lets you save and print the puzzles that you create. For more information, refer to WordJunction's comprehensive on-line help file.

FILES FOR DOWNLOAD

WJ.EXE—The executable program file.
WJ.HLP—The help file.
WJ.TXT—The documentation file.
WJ.ZIP—All the source, program, and documentation files packaged in a .ZIP archive file.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

The Natural Foible of Floating-Point Calculations

Recently, I used Microsoft's QBasic—which ships with MS-DOS 6.2—to add several numbers together via a PRINT command: PRINT 3.26 + 3.25 + 2.55. The result was 9.059999.

In the light of the recent Intel Pentium bug, I immediately suspected my laptop's Cyrix 486 chip. Thus, I tried the computation in PowerBASIC 3.00a and ASIC 4.00, but both supplied the correct value of 9.06. The problem seems to be with QBasic.

NATHANIEL MEO, Bethesda, Maryland

PC MAGAZINE: The result of your calculation is clearly not correct, but QBasic is not entirely to blame. When today's computers perform calculations using floating-point numbers, there is always some margin of error. Consider the representation of the fraction 1/3 in decimal format: You can use 0.3, or 0.33, or 0.333, but you can never add enough threes to represent 1/3 exactly. The same is true when computers attempt to represent fractions in binary. Because the number of available binary digits (bits) is finite, the binary representation of most decimal fractions is accurate only up to a certain point.

Significant digits is the term for the number of reliable decimal places in a floating-point number. QBasic's default data type is single-precision, which has 7 to 8 significant digits. QBasic's double-precision data type has 15 to 16 significant digits, while the data type used internally by the Pentium chip's floating-point processor has 19 to 20 significant digits.

The error in your QBasic example occurs in the least-significant digit. If you perform the same calculation with double-precision numbers (PRINT 3.26# + 3.25# + 2.55#), you still get a result with an error in the least-significant digit: 9.059999999999999. By contrast, the famous Pentium bug can cause an error in the sixth digit out of 19 to 20 significant digits. It would definitely be better if QBasic could avoid this minuscule error (as Visual Basic does), but the problem is by no means comparable with the Pentium bug.

When you are performing calculations with

floating-point quantities, find the input value with the most decimal places and display the result within that number of decimal places. In Mr. Meo's example, all three terms in the calculation have two decimal places, so the output should also have two decimal places. To limit the example calculation to two decimal places in QBasic, use the following command:

```
PRINT USING "#.##": 3.26 + 3.25 + 2.55
```

This yields the correct answer: 9.06.

Customizing the Windows 95 Boot Process

When running Windows 3.11, I used to boot to my own DOS batch file menu, launch the GUI from there, and return to the menu after exiting. From this menu, I could also run rogue DOS applications and do all of my troubleshooting while avoiding any conflicts with Windows.

I was able to reproduce most, but not all, of this setup under Windows 95. First, I added a line to Msdos.sys that read Boot GUI=0. This caused Windows 95 to boot to a DOS prompt where only the primary Command.com was loaded. After I made a change to AUTOEXEC.BAT, my system successfully booted to my batch file menu (Menu.bat).

Once inside the Windows 95 GUI, I added the following line to Exitto~1.pif:

```
Command.com /k Menu.bat
```

Although this returned me to my menu when I selected "Restart the Computer in MS-DOS Mode?" from the Shut Down dialog, MEM revealed that Win.com was loaded and that I was working from a secondary command processor. Is there a way to exit Windows 95 completely and return to a DOS prompt that uses the primary command processor without Win.com?

BOB GRIFFIN, via CompuServe

PC MAGAZINE: I do not find Win.com in memory after exiting to your MS-DOS mode, but Windows 95 does offer a way to start from—and exit to—the version of your DOS that was

HIGHLIGHTS



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OPERATING ENVIRONMENTS A helpful little utility that nags you to perform a task—like backing up or defragging your disk—once a month. Page 304



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previously installed on your system. First, you must add `BootMulti=1` to the [Options] section of `Msdos.sys`. Then, if you press F4 early in the startup process, your system will boot to your old version of DOS. (To boot directly to DOS, add `BootWin=0` to the [Options] section of `Msdos.sys`. In this case, pressing F4 will boot your system to the normal Windows 95 GUI.)

Windows 95's `Msdos.sys` is not the familiar system file that was a companion to `IO.SYS` in Windows 3.x. It is a read-only, hidden text file that is similar to a Windows .INI file. To remove its read-only and hidden properties, right-click on it, select Properties from the resulting context menu, and remove the checks next to Read-only and Hidden. Do not forget, however, to make a backup copy of `Msdos.sys` in case you make a mistake while editing. Next, open the file with Notepad and make the necessary changes. Here are the values in the [Options] section of `Msdos.sys` that you may want to set:

- `Logo=0`: Boot without the Windows 95 bitmap.
- `BootGui=0`: Boot to Windows 95 command prompt.
- `BootMulti=1`: Enable multiboot to DOS.
- `BootWin=0`: Boot to previous version of DOS (if `BootMulti=1` is present).

After saving and closing the file, restore the Read-only and Hidden attributes.

To change the result of the "Restart the Computer in MS-DOS Mode?" option in the Shut Down dialog, locate the file called `Exit` to DOS (its 8.3 alias is `Exitto~1.pif`). Once you bring up its Properties dialog, move to the Program tab, press the Advanced button, and select the "Specify a New MS-DOS Configuration" radio button. The edit boxes below this selection initially contain copies of your existing `CONFIG.SYS` and `AUTOEXEC.BAT` files. By adding or removing lines, however, you can control what gets loaded when you restart the computer in MS-DOS mode.

Windows 95 also contains several hotkeys that can alter the boot process on the fly. Many of these are similar to the keystrokes that govern the MS-DOS boot process:

- F5: Boots the system to Windows 95 Safe Mode, which bypasses startup files and loads only real-mode drivers.
- Shift-F5: Boots the system to Safe Mode without the GUI.
- Ctrl-F5: Boots the system to Safe Mode and bypasses compression drivers.
- F4: Boots the system to your previous version of MS-DOS if `BootMulti=1` is in `Msdos.sys`.
- F6: Boots the system to Safe Mode with networking.
- F8: Displays the Windows 95 Boot menu, which lets you choose many of the above options.
- Shift-F8: Lets you create a boot log and displays a line-by-line confirmation of your system's attempts to load the Registry, CON-

FIG.SYS, `AUTOEXEC.BAT`, and all your Windows drivers. You can accept or reject the loading of each. If you load `CONFIG.SYS` and `AUTOEXEC.BAT`, you can accept or reject each individual line in these files.

Using the Esc key with CHOICE

I was just looking at `PKDOZIP.BAT` in the column of March 14, 1995. Your use of the `FOR...IN...DO` command and corresponding labels in conjunction with `CHOICE` is impressive. You do a lot in a very few lines.

One thing I've noticed about your routines is that you always provide an option for the user to exit gracefully. I sure wish all programmers would do this. One way to handle it in a batch file is to combine the Esc character with the `CHOICE` command. The example batch file in Figure 1 illustrates how Esc can be used in a `CHOICE`-based menu. Before trying it, you'll need to replace `{esc}` with the actual escape character, a left-pointing arrow. If you use DOS Edit, just press Ctrl-P followed by Esc to produce the character.

STEPHEN CERRUTI, via ZD Net

PC MAGAZINE: We computer users are pretty well trained. When we want to avoid making a choice, we reach for the Esc key. It's definitely a good idea to write your batch files so that the user has a way out, and the Esc key is the logical choice.

When the user presses one of the keys in the list following `CHOICE`'s /c: switch, the `ERRORLEVEL` is set to the position of that key in the list. In addition, if an error occurs, `CHOICE` sets the `ERRORLEVEL` to 255, and if the user breaks out with Ctrl-Break or Ctrl-C, `CHOICE` sets the `ERRORLEVEL` to 0. To interpret the `ERRORLEVEL` returned by `CHOICE`, you have to bear in mind that the test "IF `ERRORLEVEL n`" returns true if the `ERRORLEVEL` is greater than or equal to `n`.

DOS's HELP system says: "When you use `ERRORLEVEL` parameters in a batch program, list them in decreasing order." Unfortunately, this is not always correct. It's true when the IF `ERRORLEVEL` tests are followed by GOTO commands. In that case, you must indeed make the tests in descending order. Each test returns false until you reach the actual `ERRORLEVEL`, at which point the GOTO command jumps elsewhere in the program. The remaining tests don't get executed at all. If the commands after the IF `ERRORLEVEL` tests are not GOTOS,

however, but SET commands assigning a value to a variable, you must make the tests in ascending order. Each test up to and including the actual `ERRORLEVEL` returns true and sets the variable to a new value. The remaining tests return false and leave the variable unchanged.

If this seems too confusing, you can double up the IF `ERRORLEVEL` tests and ignore the order altogether. To test for an `ERRORLEVEL` of exactly 5, for example, you can use

```
IF ERRORLEVEL 5 IF NOT ERRORLEVEL 6
```

This double test will return true only if the `ERRORLEVEL` is exactly 5.

The batch file in Figure 1 uses a mixture of these three techniques. If the `ERRORLEVEL` is 4 (Esc) or greater (error), it jumps to the label `Terminate`. This test comes first, because it transfers control elsewhere with a GOTO. The next test is a double test for an `ERRORLEVEL` of precisely zero, so its order is irrelevant. Finally, the remaining three tests, for `ERRORLEVEL`s 1, 2, and 3, are in ascending order. If the user pressed D, for example, the `ERRORLEVEL` is 2. The first two tests are true, so `DRV` gets set to C and D in turn. The third test is false; 2 is not greater than or equal to 3. So `DRV` retains the value D, just as the user intended.

The batch file is available from PC Magazine Online (see the sidebar "Guide to Our Utilities" for more information).

```
@ECHO OFF
ECHO.
ECHO Select a drive for (simulated) Backup.
ECHO.
ECHO [C] Backup C: Drive
ECHO [D] Backup D: Drive
ECHO [E] Backup E: Drive

REM {esc} in next line to be replaced by
REM Escape character
CHOICE /c:cde{esc} /n "Enter your choice,
ESC exits: "
IF ERRORLEVEL 4 GOTO Terminate
IF ERRORLEVEL 0 IF NOT ERRORLEVEL 1 GOTO
Terminate
IF ERRORLEVEL 1 SET DRV=C
IF ERRORLEVEL 2 SET DRV=D
IF ERRORLEVEL 3 SET DRV=E

ECHO Now simulating backup of drive %drv%:
GOTO Exit

:Terminate
ECHO Operation terminated by user

:Exit
```



FIGURE 1: This batch file demonstrates use of the Esc key to get out of a `CHOICE`-based menu.

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APS MS 2.0 ⁵	Micropolis 1955MB	899 ⁹⁵	999 ⁹⁵
APS ST 2.0 ⁵	Seagate 2047MB	999 ⁹⁵	1099 ⁹⁵
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APS MS 4.0 ⁵	Micropolis 4095MB	1299 ⁹⁵	1399 ⁹⁵
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GENE GARRETSON, Garland, Texas

PC MAGAZINE: Gee, I'd be happy to tell you the answer if you'd swap a copy of that software! Actually, though, the answer is easy: You shouldn't have any problem running your software on a new system with a Super VGA graphics adapter. The reason is that the VGA specification is backward-compatible with prior graphics adapters, right back to the CGA

(Color Graphics Adapter) that came out with the original IBM PC. These older display modes are of little use today except for running older software such as yours. Your new computer system should let you analyze your investments faster than ever before.

—Alfred Poor

Multimedia Nightmare

When I upgraded to a 486DX2/66 system, I purchased a VL-Bus graphics adapter from a brand-name manufacturer. After working with the card for a week, I found that a number of multimedia programs on CD-ROM would not run smoothly—if they ran at all. After I repeatedly spoke with the graphics card company's technical support people, they finally suggested I purchase a different card from a different company. So, based on one of your reviews of graphics cards, I chose a different card—only to find that I had the same problems with the multimedia programs. This company told me that these programs are designed for a graphics card with the Tseng ET4000 chip and that I needed to buy a card with that chip instead.

I don't want to buy every graphics card on

the market just to find one that works with my multimedia applications. All I want is compatibility and good performance. Is this really an impossible dream?

DANNY L. BARRICKMAN,
Millville, New Jersey

PC MAGAZINE: There's no doubt that multimedia is still a frustrating and confusing area in which there are no easy answers. It sounds like the manufacturers of your first two cards simply took the easy way out by telling you to buy someone else's card. But your adapter may not be the problem at all.

When a digitized video clip plays on a computer system, you may get jerky motion, sound that's out of sync with the image, and even breaks in the sound. While it's true that the graphics adapter's performance may be the source of these problems, there are a number of other possibilities to consider as well.

First and foremost, there may be a configuration conflict. Two adapters sharing an IRQ setting, a memory address, or a DMA channel can result in unpredictable but nearly always undesirable consequences. If the system is made of components that you've configured and installed yourself, you need to be especially careful to make sure that none of the parts are warring among themselves.

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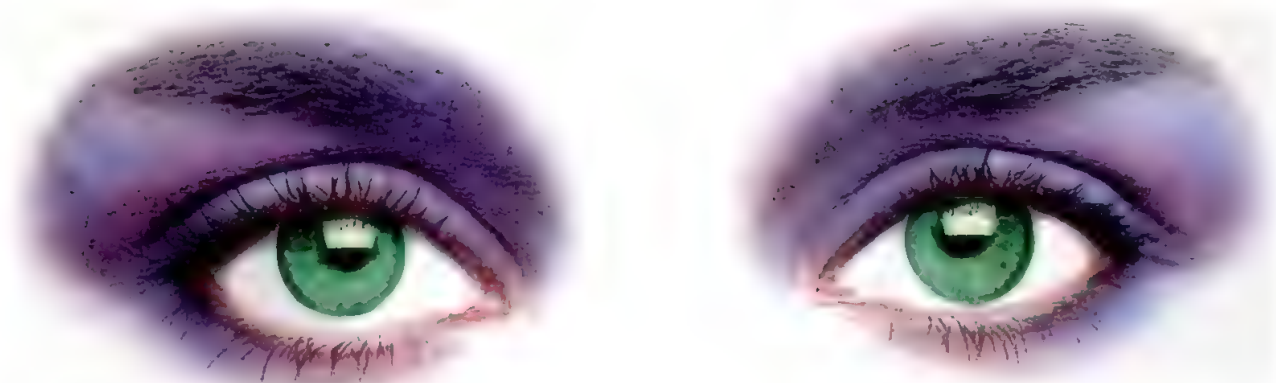
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Barracuda Wide	2.4 GB	SCSI	8ms	7200	1024K	955
Barracuda Wide	4.2 GB	SCSI	8ms	7200	1024K	1375
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UltraStar	2.2 GB 3.5"	8 ms	7200	1024 K	5 Year	885
UltraStar	4.5 GB 3.5"	8 ms	7200	1024 K	5 Year	1355
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CFP4207	4.2 GB	SCSI	9ms	7200	512K	1025
CFS1275	1.2 GB	IDE	14ms	3600	64KB	240

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Lightning	730 MB	IDE/SCSI	11 ms	4500	128K	n/a/195
Trailblazer	850 MB	IDE/SCSI	11 ms	4500	128K	195/220
Fireball™	1080 MB	IDE/SCSI	10 ms	5400	128K	210/280
Atlas	2.2 MB	SCSI	8.5	5400	1024K	675
Capella	2.1 GB	SCSI	8 ms	7200	1024K	805
Grand Prix	4200 MB	SCSI	8.6 ms	7200	512K	975
Atlas	4.3 GB	SCSI	8 ms	7200	2048K	1375

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M3243	4.3 GB	SCSI	8.5 ms	7200	512K	1015
M1991	9.0 GB	SCSI	11 ms	5400	512K	1955
M4221Wide	2.1 GB	SCSI	8.5 ms	7200	512K	855
M3243Wide	4.3 GB	SCSI	8.5 ms	7200	512K	1125
M1991Wide	9.0 GB	SCSI	11 ms	5400	512K	2055
M4221AV	2.1 GB	SCSI	8.5 ms	7200	512K	799
M3243AV	4.3 GB	SCSI	8.5 ms	7200	512K	1105
M1991AV	9.0 GB	SCSI	11 ms	5400	512K	2075

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The hard disk and the CD-ROM drive also can be significant bottlenecks. A multimedia program must move enormous amounts of data within the system, and anything that restricts that flow can affect performance. For example, if you have an 8-bit interface on

A multimedia program must move enormous amounts of data within the system, and anything that restricts that flow can affect performance.

your hard disk, your CPU may be getting starved for data; a 16-bit interface is the minimum, and a VL-Bus controller would be even better. Similarly, multimedia programs typically require a CD-ROM capable of at least a 300-Kb-per-second data transfer rate (double speed), though the newer quad-speed designs produce noticeably better performance for some applications.

If you're running Windows applications, you must also make sure that your system is configured for best performance. Having your display set for too high a resolution or color depth can adversely affect performance. You also need at least 8MB of memory; programs run significantly slower on systems with just 4MB of memory.

All of these factors may be more significant than your choice of graphics card or chip, assuming that you're using a VL-Bus graphics adapter. Give your system a thorough checkup and make certain there is no other bottleneck that is limiting performance. If you still aren't satisfied with the results, take one of the programs to a local computer store and run it on a similar system there—the problem may simply be that your expectations exceed what a system of this caliber is able to deliver.—*Alfred Poor*

Device Dilemmas

Are dual floppy disk drives reliable? If I were to get one for my current system and wanted to move it to a new system later, would I be able to fit a dual floppy disk drive, two hard disks, an internal CD-ROM, and an internal removable drive all in one system? Could I run them all with an E-IDE controller? What is the limit for E-IDE?

JOHN NI, Toronto, Ontario, Canada

PC MAGAZINE: I don't know of any long-term data on the reliability of the new "combo" floppy disk drives that squeeze both a 3.5-inch

and a 5.25-inch disk drive into a single half-height housing. I've owned two; one failed after a year or so, and the other is running fine. The advantage is that these drives save space, especially if your case doesn't have a special 3.5-inch floppy disk drive bay. The disadvantage is that if one drive breaks down, you have to repair the whole unit (or do without that drive).

Dozens of different computer cases are on the market with varying capabilities in terms of disk drive bays. If you're willing to go with a tower-case design, you should be able to fit at least a half-dozen removable media devices without any problem—more than enough for the three you list.

IDE controllers support only two hard disks. E-IDE supports up to two devices on each of two separate channels and adds support for devices other than hard disks, such as CD-ROM drives. Some E-IDE controllers also include floppy disk controller circuitry. So as long as your removable drive supports an E-IDE connection, you should be able to connect all six drives to the one controller, although this will max out its capacity. You might want to consider a SCSI interface instead of the E-IDE, however; for the same price or just slightly more, you can get an interface that will support all the devices you list and still have room to spare for other devices, such as a tape backup or scanner.—*Alfred Poor*

OPERATING ENVIRONMENTS

Swapping LPT1 and LPT2



Although I read PC Magazine regularly, I never did learn to use DEBUG to create programs on my own. What I need is a small utility that directs the print screen command to an LPT port other than LPT1. Can you help?

DAVID WIDMAYER, via the Internet

```
N LPTSWAP.COM
A 100
MOV AX,40
MOV DS,AX
MOV AX,[8]
XCHG AX,[0A]
MOV [8],AX
RET

RCX
10
W
Q
```

FIGURE 2: The program produced by this DEBUG script swaps the addresses of LPT1 and LPT2 in low memory, effectively swapping one port with the other.

PC MAGAZINE: The addresses for the LPT1, LPT2, and LPT3 printer ports are stored in low memory, and a program can freely swap them. In the early days of the IBM PC, many programs ignored LPT2, so this question came up a lot. Simply redirect the script in Figure 2 into DEBUG to produce LPTSWAP.COM. Run the program once and it swaps LPT1 and LPT2; run it again and it swaps them back. Do note that swapping the printer ports' addresses has a global effect and cannot be restricted to the print screen function.—*Neil J. Rubenking*

Handling Once-a-Month Tasks

A friend of mine never defrags his hard disk—or performs any other maintenance, for that matter. As a result, his hard disk crashed recently and left him with a bunch of messed-up files. I'd like to give him a little reminder program to add to his AUTOEXEC.BAT that would do nothing but prompt him regularly to run SCANDISK, OPTIMIZE, or any other clean-up program so he'd keep his drive in better shape. The program should, as he boots up, check whether he's performed the routine maintenance within a specified period (say, once each month) and remind him if he hasn't yet done it. Of course he could just ignore the prompt, but at least he'd be reminded every day.

KEN BUCKNER, via ZD Net

PC MAGAZINE: The User-to-User column has printed batch files that run just once a day; your request can be handled by a variation on this concept. It's common to want certain AUTOEXEC.BAT commands to execute only the first time a system boots on a given day. The technique for doing this involves keeping a zero-byte marker file with an otherwise-unused extension. The batch file checks whether a file with the current date for its name and the specified extension exists. If not, it runs the once-a-day activity and renames the marker file so its name is the current date. When the batch file runs again on the same date, it finds that the marker already matches, so it skips the once-a-day activity.

To create a similar test that's monthly rather than daily, we need to extract the two-digit month from the current date. DOS doesn't offer any commands to extract a substring from a string, but we can use the peculiar behavior of the FOR command. If an item in the FOR command's list begins with a forward slash (/), FOR splits it into two items: the first character and the remainder. ONCEAMON.BAT (Figure 3) uses this fact to extract the first two digits from the date and store them in the environment variable Month. Then it checks whether a marker file whose name matches the current month exists. If not, it asks the user whether to perform the

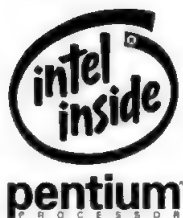


ALL THE WHOS DOWN IN WHOVILLE LIKED COMPUTERS A LOT
BUT THE GRINCH, FOR SOME REASON, HE MOST CERTAINLY DID NOT!
IT MAY HAVE BEEN THAT HIS COMPUTER OFFERED NO TECHNICAL SUPPORT...
OR THAT THE PRE-INSTALLED SOFTWARE COULDN'T DEVELOP A WHOVILLE
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OR MAYBE, JUST MAYBE, HE HATED
THEM ALL...

BECAUSE HIS HARD DRIVE WAS
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Source: PC Magazine "Tapping the Promise of the Pentiums" - May 30, 1995

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once-a-month activity. On a Yes answer, it re-names the marker so it does match the current month. After that, the once-a-month question won't reappear until the next month.

ONCEAMON.BAT assumes you keep your

batch files in the directory CABAT. If you use a different directory, you'll want to make a global change. It uses the oddball extensions DAY (D, A, and the Yen symbol) and MOÑ (M, O, and N-with-tilde) for the marker files.

```
@ECHO OFF
REM ONCEAMON.BAT - Performs specified actions once a month
IF NOT '%2'==' ' GOTO GotDate
ECHO @PROMPT %0 $d > C:\BAT\ONCE$$$1.BAT
REM DO NOT substitute CALL for COMMAND /C in next line
COMMAND /C C:\BAT\ONCE$$$1.BAT > C:\BAT\ONCE$$$2.BAT
C:\BAT\ONCE$$$2

:GotDate
REM Now %1 contains day of week, %2 contains date.
DEL C:\BAT\ONCE$$$?.BAT
IF EXIST C:\BAT\%2.DAY GOTO End
IF EXIST C:\BAT\*.DAY GOTO DayExists
REM If marker doesn't exist, create it.
REM > C:\BAT\XXXXXXXXX.DAY

:DayExists
RENAME C:\BAT\*.DAY %2.DAY
ECHO.
ECHO Insert once-a-day activity here
ECHO.
IF NOT '%1'=='Fri' GOTO NotFriday
ECHO.
ECHO Insert only-on-Friday activity here
ECHO.

:NotFriday
SET Month=
SET WasDate=%2
REM Strip first char from Date
FOR %%v IN (%WasDate%) DO SET Date=%%v
REM Add stripped first char to Month
FOR %%v IN (%WasDate%) DO IF '%%vDate'=='%WasDate%' SET Month=%%v
SET WasDate=%Date%
REM Strip first char from Date
FOR %%v IN (%WasDate%) DO SET Date=%%v
REM Add stripped first char to Month
FOR %%v IN (%WasDate%) DO IF '%%vDate'=='%WasDate%' SET Month=%Month%%v
SET WasDate=
SET Date=
REM Now variable Month contains the two-digit month
IF EXIST C:\BAT\%Month%$$$$$.MOÑ GOTO End
IF EXIST C:\BAT\?$$$$$.MOÑ GOTO MonExists
REM If marker doesn't exist, create it.
REM > C:\BAT\XX$$$$$.MOÑ

:MonExists
CHOICE Perform once-a-month activity
IF ERRORLEVEL 2 GOTO End
RENAME C:\BAT\?$$$$$.MOÑ %Month%$$$$$.MOÑ
ECHO.
ECHO Insert once-a-month activity here.
ECHO.

:End
```

FIGURE 3: This batch file nags you once a day until you agree to perform an important once-a-month activity, perhaps running CHKDSK or defragging your hard disk.

Of course you can change these if you wish, as long as you do it globally.
—Neil J. Rubenking

Swap the Ctrl and Caps Lock Keys In Windows

There are many DOS-based utilities that remap the left Ctrl and Caps Lock keys, effectively exchanging their positions. I'm an old WordStar fan, and having the control key to the left of the A key is important to me. Do you know of a Windows utility that can do this? I'd like to have the Ctrl key next to the A key when I use Windows applications.

KEITH J. BERNSTEIN,
Somerville, New Jersey

PC MAGAZINE: WinKey is a \$15 shareware utility that does exactly what you want and more. You can download WINKEY.ZIP from ZD Net's PBSUTIL forum, library 4 (Windows), or from CompuServe's WINSHARE forum, library 6 (General Win Utils). Besides swapping the Ctrl and Caps Lock keys, WinKey's features include the following:

- Shift keys always yield uppercase, even when Caps Lock is on.
- Caps Lock is turned off by pressing Shift, like on a typewriter.
- Caps Lock is turned off by pressing a shifted letter key.
- Num Lock is permanently on or off.
- Scroll Lock is permanently on or off.

If you don't have access to CompuServe or ZD Net, you can contact the publisher, DataGem Corp., at 206-391-4415.

—Neil J. Rubenking

WORD PROCESSING

Removing WordPerfect Print Enhancements



A single WordPerfect command adds the markers for both the beginning and the end of a print enhancement, such as underlining. Since you can't insert the on and off markers separately, it can be difficult to remove the enhancement from only a few characters within a block of text. The obvious if somewhat clumsy solution is to remove the enhancement entirely and then add it back separately to the two sections of text where you want it.

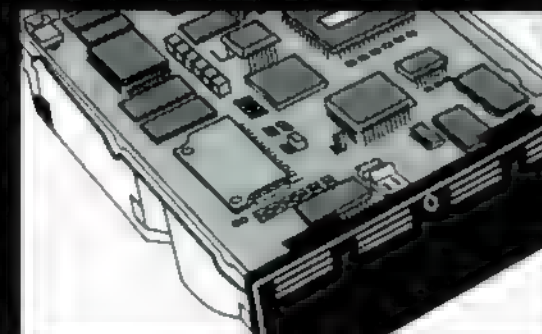
There is, however, an easier way. If, for example, you want to remove the underlining from the middle of a block in WordPerfect for DOS 5.1 or 6.0, place the cursor at the position where you want the underlining to stop and hit F8. Move the cursor to the point at which you



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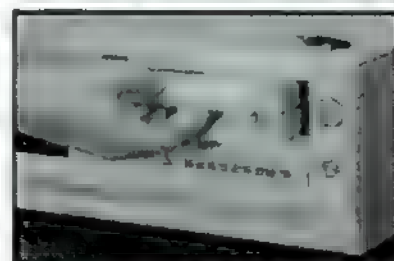
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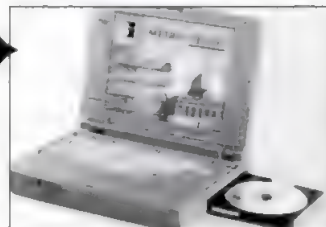
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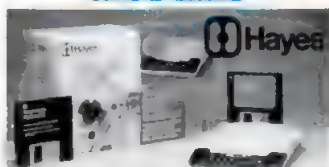
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want the underlining to resume and press F8 again. Then hit the backspace key, which deletes the underline code and removes the underlining between the two positions. This trick is particularly useful for removing a single enhancement from text with multiple enhancements.

T. S. RAMAN, New Delhi, India

PC MAGAZINE: This trick works in both WordPerfect for DOS 5.1 and 6.0, but if you're using Version 6.0, there's an even easier method: Simply block the text from which you want to remove the enhancement and then give the command to turn off the enhancement. If the text is underlined, for example, move the cursor to the point where you want the underlining to stop. Press Alt-F4 to turn on the block, then extend the block to the place where you want underlining to restart and press F8. WordPerfect will insert an underline off code at the beginning of the block and an underline on code at the end. The procedure for removing boldface from a text block is essentially the same, but you use the F6 key instead.

A slight variation is required, however, if you use Ctrl-F8 to set the enhancements through the Font dialog box—as you must with other enhancements. After you block the text and enter Ctrl-F8 in WordPerfect 6.0, the program will display a dialog box with check boxes that indicate the enhancements to the highlighted text. To remove an enhancement, you need only uncheck the appropriate box. Then choose OK and WordPerfect will enter the off code at the beginning of the marked block and the on code at the end.

Note that WordPerfect 5.1 doesn't have check boxes. If you choose Ctrl-F8, Appearance, and then the appropriate enhancement, WordPerfect will simply enter the on and off codes the same way it enters them with the F8 and F6 function keys. So with Version 5.1, there's no difference in approach between using the function keys and using the Ctrl-F8 menus.

Not so incidentally, this approach works in Version 5.1 because when you enter enhancement codes within text already formatted with that enhancement, WordPerfect enters the off code first and then the on code. After you've entered two sets of codes, they are in the order:

```
[off code][on code]...[off code][on
code]
```

Immediately after you enter the second command, the cursor is between the second off code and on code. So when you backspace, WordPerfect deletes the second off code along with the first on code that it finds before that. If you use Alt-F3 to set the program to show codes, WordPerfect will simply delete the codes. Otherwise, it will ask for confirmation first.—M. David Stone

SPREADSHEETS

Editing Headers in Excel



I need to edit headers in a number of Excel spreadsheets and would like to avoid the tedious journey through menus to get to the center editing section of each header. (The edits are unique to each header.) I attempted to record a macro, but when I got the cursor inside the header section of the Page Setup dialog box, I couldn't stop recording without first exiting the dialog. Is there a way around this?

PAUL E. CROSS,
Citrus Heights, California

```
Sub EditCenterHeader()
    Prompt$ = "Enter new center header"
    Prompt$ = Prompt$ + " or click Cancel to remove header"
    With ActiveSheet.PageSetup
        CurrentCenterHeader$ = .CenterHeader
        .CenterHeader = InputBox(Prompt$, "Center Header", _
            CurrentCenterHeader$)
    End With
End Sub
```

FIGURE 4: This simple macro lets you easily edit the center portion of an Excel spreadsheet header.

PC MAGAZINE: There's no way around the problem of being unable to stop the macro recorder while you're in the Page Setup dialog box. The recorder is designed to transcribe completed actions. You can't use it simply to make a macro display a dialog box.

Fortunately, you don't need the Page Setup dialog box to assign or modify a header. Headers, like other user-definable settings in Excel, are properties that you can read and set with Visual Basic, Applications Edition (VBA) programming code. The property you're interested in—the one that sets the center portion of a header—is called CenterHeader. Excel also has related properties called LeftHeader, RightHeader, LeftFooter, CenterFooter, and RightFooter. These six are among the many properties of an object called PageSetup.

The simple macro shown in Figure 4 will help you edit your center headers. The macro uses VBA's built-in InputBox dialog to display the current setting of the center header and prompt you for a new setting. To modify the header, just edit or type. To remove the header, press the Delete key, click Cancel, or press Esc.

Note that the macro is designed to modify the header for the current sheet—the one you're in when you invoke the macro. You can run the macro from any type of Excel sheet: a worksheet, a macro module, a chart, or a dialog sheet.

Obviously, you can create similar macros to change other components of your headers and footers—simply substitute one of the other header or footer properties listed above. For example, to make the macro change the flush-left component of the current sheet's footer, substitute LeftFooter for CenterHeader.

When you're typing in the InputBox dialog, you can use any of Excel's standard header and footer formatting codes, as well as ordinary text. To make the text "My new centered header" appear in boldface and italics, for example, you could type

&B&I my new centered header

To see a table of Excel's header and footer formatting codes, highlight the word . Cen-

terHeader (or another header or footer property) in your macro code and press F1. In the help screen that appears, click anywhere on the words "format codes."—Craig Stinson

DATABASES

Snaking Column Reports in Microsoft Access



I want to print a two-column list of records containing two fields per record on an 8.5- by 11-inch sheet of paper in landscape view. Then I want to cut the sheets in half and insert them into a two-hole binder. The first column must print completely in ascending order and then the sequence must continue onto the second column (of the same page); then the sequence should continue in like fashion on subsequent pages.

I can't figure out how to accomplish this using Microsoft Access. The closest thing seems to be the two-column mailing-label format, but this is unacceptable because the records sequence alternately on both columns, not first one column then the other. The Report Wizards are no help. The manual is of no help. How can I accomplish what I want?

MICHAEL G. JOHNSTON,
via CompuServe

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Desktop	Pentium 90		1GB	2319
Minitower	Pentium 75		630MB	1629
Minitower	Pentium 75		1GB	2129
Minitower	Pentium 100		1GB	2399
Minitower	Pentium 133		1GB	3139

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Chassis	Processor	MB	Price
Minitower (910)	Pentium 75	850MB	\$1749
Minitower (915)	Pentium 100	850MB	1999
Minitower (920)	Pentium 75	1.2GB	2199
Minitower (930)	Pentium 100	1.2GB	2499
Minitower (940)	Pentium 133	1.2GB	2999

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Processor	Screen	MB	Price
486DX2/50	9.5" Active	240MB	\$2239
486DX4/75	9.5" Dual Scan	510MB	2119
486DX4/75	9.5" Active	340MB	2259
486DX4/75	9.5" Active	510MB	2479



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486DX2/50	9.5" Active	340MB	3079
486DX4/75	9.5" Dual Scan	528MB	3079
486DX4/75	9.5" Active	340MB	3319
486DX4/75	9.5" Active	528MB	3639

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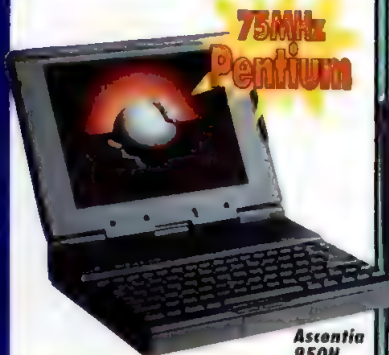
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- Windows 95 keyboard for increased productivity
- AST Works II navigation software - featuring "SPOT"
- Intel P60 overdrive processor upgradable

Model	Processor	RAM	Price
Desktop (614)	Pentium 100	850MB	\$1889
Minitorer (812)	Pentium 100	1.2GB	2089
Minitorer (814)	Pentium 100	1.2GB	2379*
Minitorer (818)	Pentium 133	1.6GB	2989*

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Processor	RAM	Price
Pentium 75	10.4" Dual Scan	500MB \$3299
Pentium 75	10.4" Dual Scan	800MB 3589
Pentium 75	10.4" Dual Scan	1.2GB 4059
Pentium 75	10.4" Active	800MB 4699
Pentium 75	10.4" Active	1.2GB 5189

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- Built-in infrared for wireless communications

Processor	Screen	RAM	Price
Pentium 75	10.4" Dual Scan	524MB	\$2449*
Pentium 75	10.4" Dual Scan	524MB	2939
Pentium 75	10.4" Active	524MB	3519

*CD-ROM Drive is an optional accessory on this model

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Extensa 450

- 10.4" Dual Scan & 9.5" Active display
- GlidePad pointing device
- Advanced battery pro
- Built-in infrared for no hassle printer connections

Processor	Screen	RAM	Price
486DX4/75	10.4" Dual Scan	340MB	\$1769
486DX4/75	9.5" Active	340MB	2349

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- Built-in infrared for no hassle printer connections

Processor	Screen	RAM	Price
Pentium 75	10.4" Dual Scan	500MB	\$3479
Pentium 75	10.4" Active	772MB	4499
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CIRCLE 092 ON READER SERVICE CARD

PC MAGAZINE: What you're trying to create is commonly called a *snaking column* report. Such a report prints all of column one, then loops back to the top of column two, continues through column two, then loops back to the top of column three, and so on. If you draw a line that follows this path, you'll end up with a coiled line resembling a snake. For more information on snaking columns, search for the snaking columns help topic in the Microsoft Access 2.0 help file.

Access can do this quite easily once you know where to set things up properly. The controls you need are on the Print Setup dialog shown in Figure 5, but unfortunately they're hidden by default, exposed only when you press the More button.

The Items Across setting in the Print Setup dialog tells Access the number of columns you want. You'll need to change this to 2 (or more, depending on your reporting needs). Next, make sure the Same as Detail option is not checked, then change the Width setting to the width of a single column. For example, on a landscape page with two columns, you might choose 5 inches for the width of a single column, assuming the normal default margins. Finally, set the Item Layout option to Vertical instead of Horizontal, which is the default. This tells Access to fill one column before going on to the next, producing the desired snaking column effect.

You have to be aware of a few rules when you design a multicolumn report this way. Usually you'll want the space allocated to your Page Header and Footer to span an entire page, not just a single column. To do this, you set the width of the report in the Report Designer to the complete width of a printable page and place your Header and Footer items as you normally would. When you place your Detail section items, however, you must restrict yourself to the width of a single column (5 inches, for example). That's because Access uses the Report Designer width for the Header and Footer sections

```
*****
* FUNCTION Leapyr( dDate or cYear or nYear )                               FoxPro
* Returns .T. if the year in the parameter passed is a leap year.
* Good in scheduling routines that need to consider whether to schedule
* for February 29th.
*
* Function accepts:
* A character or numeric year value '1996' or 1996 or a date value
*****
```

```
FUNCTION Leapyr
PARAMETER dDate
DO CASE
CASE TYPE("dDate") = "N"           && If Numeric or Char convert to Date
    dDate = CTOD("1/1/" + ALLTRIM(STR(dDate,4,0)))
CASE TYPE("dDate") = "C"
    dDate = CTOD("1/1/" + ALLTRIM(dDate))
ENDCASE
nCurrentYear = YEAR(dDate)         && Get year
nYearNext = nCurrentYear + 1       && Get next year
dYearNext = CTOD("1/1/" + ALLTRIM(STR(nYearNext,4,0)))
dCurrentYear = CTOD("1/1/" + ALLTRIM(STR(nCurrentYear,4,0)))
nDays = dYearNext - dCurrentYear && Calculate days
RETURN nDays > 365
```

FIGURE 6: The Leapyr function returns .T. if the year in the value passed is a leap year, or .F. otherwise. See the IsLeap function in the text for a faster technique.

and the Print Setup dialog width for the individual columns.

Although the dialogs will change somewhat in Microsoft Access for Windows 95, the overall process will work much the same way.—*Sal Ricciardi*

Checking for Leap Years

Here's a FoxPro function your readers might like, especially if they do any type of date scheduling or just want to see if a certain year is a leap year. The Leapyr function shown in Figure 6 can be passed a date, a year stored as a character string, or a year stored as a numeric. The function returns .T. if the year in the value passed is a leap year, and .F. otherwise.

JAMES D. TURNER,
Raleigh, North Carolina

PC MAGAZINE: Mr. Turner's Leapyr function takes a logical approach to determining whether a year is a leap year. It determines the number of days in the year in question and returns .T. if that number is more than 365. Because leap years have 366 days, this method works fine.

Another unique characteristic of leap years is that February 29 is a valid date in those years. You can use this information to create an

even faster technique for determining whether a year is a leap year: Just check to see whether 2/29 is valid in that year. For example:

```
FUNCTION IsLeap
PARAMETER dDate
RETURN
!EMPTY(CTOD("02/29/" +
->STR(YEAR(dDate))))
```

This technique works because FoxPro's CTOD () function returns an empty date for dates that are not valid.—*Sal Ricciardi*

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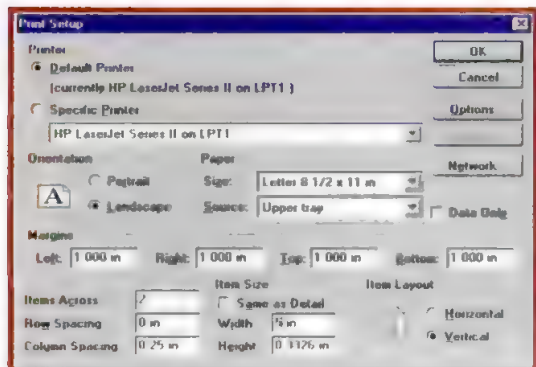


FIGURE 5: You can print snaking column reports in Microsoft Access by altering the settings that appear when you choose the More button in the Print Setup dialog.



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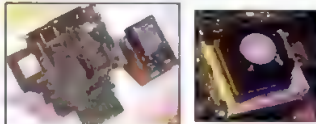
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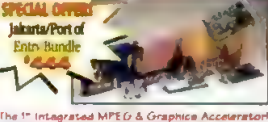
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Vectra 386/16N, 20N, 25N models	2MB	D2406A	\$89
	8MB	D2404A	\$305
Vectra 486 M, M1, N, N1 and XM models	2MB	D2381A	\$95
	4MB	D2156A	\$151
	16MB	D2676A	\$611
Vectra 386/25, 486/251; 33i; 33ST, 50i, 66i and 66ST	2MB	D2381A	\$95
	8MB	D2152A	\$329
Vectra 386/33N, N1 models	2MB	D2714A	\$92
	8MB	D2715A	\$304

IBM

Aptiva 300, 500 and 700 series	4MB	n/a	\$159
	16MB	n/a	\$509
Edusquest 55	4MB	74G1299	\$174
Edusquest 90, 90 and 50 models	4MB	60G0896	\$174
	16MB	60G0898	\$549
PS/1 286, 386SX	2MB	92P9935	\$83
	4MB	92P9694	\$161
Valuepoint Performance models	4MB	92G9201 or 73G1311	\$169
	8MB	92G7520 or 73G1312	\$329
PS/1 Consultant, Essential, Expert models x43, x44	4MB	96P9290	\$177
PS/Valuepoint all models except Cxx models	4MB	96P9290	\$177
PS/1 Consultant, Essential, Expert models	16MB	96P9291	\$609
PS/2 25/286, 30/286	2MB	30F360	\$79
PS/2 35SX, LS, 40SX, 50i, 55SX, LS, 65SX, LS, 70, XStation	2MB	64S0604	\$87
PS/2 70-A21, B61, B21, B61, PS/Valuepoint Cxx models	2MB	64S0608	\$95
PS/1 Consultant, Essential, Expert models	2MB	64S0608	\$95
PS/2 35SX, LS, 40SX, 55SX, LS, 65SX, LS, XStation, PS/Valuepoint Cxx models	4MB	34F2933 or 87P9977	\$179

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	8MB	\$359
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	32MB	\$1,379

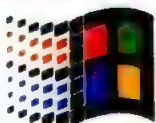
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MB	Call
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*** PC Magazine, May 16, 1995

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*** Windows Sources Magazine, April 1995

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	16MB	Call
	32MB	Call
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TravelMate 4000M, 4000E	4MB	\$189
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TravelMate 5000	4MB	\$429
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	24MB	\$999
T1900, T4500, T4600,	4MB (3.3 V)	\$189
T4700, T4800, T4850, T4900	8MB (3.3 V)	\$359
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T3400, T3600	4MB	\$189
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	8MB	\$488
	16MB	\$999
	32MB	\$1,916
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Cx486DRC2-33/66	\$187
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OverDrive Pentium-85	\$274
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Lightning 966	\$259
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810MB, 8MB, 10.4" Dual Scan Color	4,299
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540MB, 8MB, 10.4" Active Matrix Color	4,649
810MB, 8MB, 10.4" Active Matrix Color	5,099
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- 8/540MB
- 3x3 Desktop case

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IBM Pentium®		Model		
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Pentium® 75MHz 16/850MB	3x3	IBAG5783TH	2,082	
Pentium® 75MHz 8/540MB	8x5	IBAG5863SF	1,679	
Pentium® 75MHz 16/540MB	8x5	IBAG5863SH	2,024	
Pentium® 75MHz 16/850MB	8x5	IBAG5863TH	2,139	
Pentium® 90MHz 8/540MB	3x3	IBAG5784SF	1,794	
Pentium® 90MHz 16/540MB	3x3	IBAG5784SH	2,139	
Pentium® 90MHz 16/850MB	3x3	IBAG5784TH	2,254	
Pentium® 90MHz 8/540MB	8x5	IBAG5864SF	1,852	
Pentium® 90MHz 16/540MB	8x5	IBAG5864SH	2,136	
Pentium® 90MHz 16/850MB	8x5	IBAG5864TH	2,312	
Pentium® 100MHz 8/540MB	3x3	IBAG5785SF	1,909	
Pentium® 100MHz 16/540MB	3x3	IBAG5785SH	2,254	
Pentium® 100MHz 16/850MB	3x3	IBAG5785TH	2,369	
Pentium® 100MHz 8/540MB	8x5	IBAG5865SF	1,966	
Pentium® 100MHz 16/540MB	8x5	IBAG5865SH	2,312	
Pentium® 100MHz 16/850MB	8x5	IBAG5865TH	2,426	

NOTEBOOKS



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- 10.4" Active Matrix Color Display
- 8MB RAM
- 510MB Hard Drive
- 3 year manufacturer's warranty

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75MHz Pentium®	16/1.2GB	501772-801	2,149
100MHz Pentium®	8/850MB	501774-301	1,959
100MHz Pentium®	8/850MB w/CD	501774-601	2,159
100MHz Pentium®	16/1.2GB	501774-501	2,479
120MHz Pentium®	16/1.2GB	501814-401	2,629
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120MHz Pentium®	16/1.6GB w/CD	501814-801	3,095
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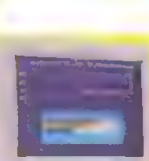
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NOTEBOOKS



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524MB, 8MB, 10.4" Dual Scan Color w/CD	2,999
524MB, 8MB, 10.4" Active Matrix Color w/CD	3,599

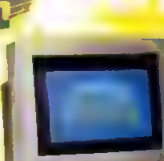
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17" DX17T, 25, 1280x1024, N.I. CMGX17T	859
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Etherlink III BNC 5pk 469
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Etherlink III TP 107
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Etherlink III TP 20pk 1,579
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- 72 pin
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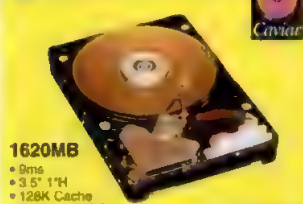
PY4X32-70

Size	Speed	Pin	Product Code	Price
2MB	70ns	30	PY1X8-70-2	\$85
2MB	70ns	30	PY1X9-70-2	95
2MB	70ns	72	PY512X32-7	89
2MB	70ns	72	PY512X36-7	105
4MB	70ns	30	PY1X8-2-4	\$169
4MB	70ns	30	PY1X9-2-4	195
4MB	70ns	72	PY1X32-70	169
4MB	70ns	72	PY1X36-70	179
8MB	70ns	30	PY4X8-70-2	\$339
8MB	70ns	30	PY4X9-3-2	319
8MB	70ns	72	PY1X32-7-2	325
8MB	70ns	72	PY1X36-7-2	385
8MB	70ns	72	PY2X32-70	339
8MB	70ns	72	PY2X36-70	375
16MB	70ns	30	PY4X8-70-4	\$649
16MB	70ns	30	PY4X9-70-4	722
16MB	70ns	72	PY2X32-7-2	649
16MB	70ns	72	PY2X36-7-2	749
16MB	70ns	72	PY4X32-70	675
16MB	70ns	72	PY4X36-70	695
32MB	70ns	72	PY4X32-7-2	\$1,145
32MB	70ns	72	PY4X36-7-2	1,325
32MB	70ns	72	PY8X32-70	1,119
32MB	70ns	72	PY8X36-70	1,325
64MB	70ns	72	PY8X32-7-2	\$2,239
64MB	70ns	72	PY8X36-7-2	2,649

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1620MB
• 8ms
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• Enhanced IDE
\$369

WD31600A

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635MB	IDE	WD2635A	11ms 3.5" 1"H	189
850MB	IDE	WD2850A	10ms 3.5" 1"H	205
1080MB	IDE	WD31000A	10ms 3.5" 1"H	255
1280MB	IDE	WD31200A	10ms 3.5" 1"H	289
1620MB	IDE	WD31600A	9ms 3.5" 1"H	369
3240MB	IDE	ST3680A	14ms 3.5" 1"H	\$175
5240MB	IDE	ST5850A	11ms 3.5" 75" H	219
1080MB	IDE	ST51080A	11ms 3.5" 75" H	249
2140MB	IDE	ST32140A	11ms 3.5" 1"H	NEW
420MB	IDE	ST9420AG	16ms 2.5" 12.7mm	NEW
524MB	IDE	ST9554AG	16ms 2.5" 19mm	399
810MB	IDE	ST9816AG	16ms 2.5" 19mm	NEW
540MB	IDE	FJ1603A	10ms 3.5" 1"H	\$185
1080MB	IDE	FJ1606A	10ms 3.5" 1"H	229
560MB	IDE	SA30560A	12ms 3.5" 1"H	\$169
850MB	IDE	SA30854A	11ms 3.5" 1"H	205
1080MB	IDE	SA31084A	11ms 3.5" 1"H	229
1080MB	IDE	SA31084A	9.5ms 3.5" 1"H	255
1272MB	IDE	SA31274A	11ms 3.5" 1"H	259
1620MB	IDE	SA31625A	11ms 3.5" 1"H	NEW
544MB	IDE	QUF8540A	12ms 3.5" 1"H	185
850MB	IDE	QUF8850A	14ms 3.5" 1"H	215
1080MB	IDE	QUF81080A	12ms 3.5" 1"H	245

**Capacities based upon manufacturer's quoted capacity 1MB=1,048,576 bytes

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ST32550N

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4294MB	SCSI	ST15230N	9ms 3.5" 1"H	1,079
8588MB	SCSI	ST410800N	11ms 5.25" FH	2,299
2147MB	SCSI	ST32550N	8ms 3.5" 1"H	879
4294MB	SCSI	ST15150N	8ms 3.5" 1"H	1,449
2147MB	SCSI	ST12450W	8ms 3.5" 1"H	1,499
2147MB	SCSI	ST32550W	8ms 3.5" 1"H	1,019
4294MB	SCSI	ST15150W	8ms 3.5" 1"H	1,479
540MB	SCSI	FJ1603S	10ms 3.5" 1"H	\$189
1080MB	SCSI	FJ1606S	10ms 3.5" 1"H	299
2140MB	SCSI	FJ2915S	8.9ms 3.5" 1"H	779
4200MB	SCSI	FJ2934S	8.9ms 3.5" 1"H	1,089
2100MB	SCSI	FJ2915W	8.9ms 3.5" 1"H	779
4200MB	SCSI	FJ2934W	8.9ms 3.5" 1"H	1,099
1200MB	SCSI	MC4221AV	8.5ms 3.5" 1"H	\$899
4300MB	SCSI	MC3243AV	8.5ms 3.5" 1"H	1,229
9100MB	SCSI	MC1994AV	12ms 5.25" FH	2,275
2100MB	SCSI	MC4221AVW	8.5ms 3.5" 1"H	999
4300MB	SCSI	MC3243AVW	8.5ms 3.5" 1"H	1,389
9100MB	SCSI	MC1994AVW	12ms 5.25" FH	2,375
540MB	SCSI	QUF8540S	12ms 3.5" 1"H	195
850MB	SCSI	QUF8850S	14ms 3.5" 1"H	259
1080MB	SCSI	QUF81080S	12ms 3.5" 1"H	335
2216MB	SCSI	QUV3221S	8.5ms 3.5" 1"H	779
2510MB	SCSI	QUX3125S	8ms 3.5" 1"H	889
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600	4	512KB	600x600	HPDJ600	299
660C	4	512KB	600x600	HPDJ660C	399
650C	6	1MB	600x600	HPDJ650C	559
1600C	8	4MB	600x600	HPDJ1600C	1,359
1600CM	8	6MB	600x600	HPDJ1600CM	1,979
LaserJet	PPM	MEM	DPI	Prod. Code	Price
5L	4	1MB	600	HPLJ5L	\$519
5P	6	2MB	600	HPLJ5P	879
5MP	8	3MB	600	HPLJ5MP	1,069

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• 2 year manufacturer's warranty
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OKIDATA					
LED	PPM	MEM	DPI	Prod. Code	Price
OL400E	4	512KB	300	OKI400E	\$349
OL410E	4	2MB	600	OKI410E	529
OL810E	8	2MB	600	OKI810E	769
OL1200	12	2MB	600	OKI1200	1,069

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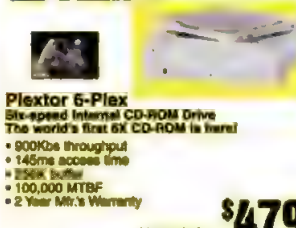


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Quad MM Kit, wavetable card, 31 titles	389
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1024 x 36 1mg	18.00	18.00	18.00	18.00	18.00
2048 x 36 1mg	18.00	18.00	18.00	18.00	18.00
4096 x 36 1mg	18.00	18.00	18.00	18.00	18.00

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256 x 36 1mg	18.00	18.00	18.00	18.00	18.00
512 x 36 1mg	18.00	18.00	18.00	18.00	18.00
1024 x 36 1mg	18.00	18.00	18.00	18.00	18.00
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8Mega	14.00	20087-005	14.00

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	AMT UPGRADED	COMPAQ PART #	PRICE
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2Mega	14.00	20087-003	14.00
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	AMT UPGRADED	TOSHIBA PART #	PRICE
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	AMT UPGRADED	NOTEBOOK PART #	PRICE
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21" MultiSync XP21	\$2137			Stealth 64 Video DRAM 4MB VLB/PCI**	\$335
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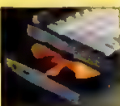
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Power CD Active Matrix

Intel 75 MHz Pentium® Processor 8MB RAM/520MB HD

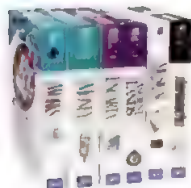
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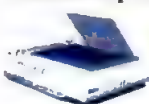
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RELISYS One Pass Color Scanners

Relisys 4816 **\$599**

1600x400 dpi optical resolution, single pass scanner



- Up to 4800x4800 dpi interpolated resolution
- 8.5" x 14" scanning area
- Super Software Package: ArtScan Pro ~ Adobe Photoshop LE ~ Kai's Power Tools SE ~ Kai's Tips & Tricks CD-ROM ~ OmniPage Direct OCR

Relisys 4816T **\$699**

• Same as above but includes Transparency Unit ~ \$499 value!

Relisys 4830T **\$999**

30-bit scanner captures over 1 Billion Colors!



- 1600x400 dpi optical resolution, single pass scanner
- Up to 4800x4800 dpi interpolated resolution
- 8.5" x 14" scanning area
- Free Transparency Unit 8.5" x 11.7" area ~ \$499 Value!
- Pro Software Package: ArtScan Pro ~ Full Photoshop 3.0 ~ Kai's Power Tools Full ~ Kai's Tips & Tricks CD-ROM ~ OmniPage Direct OCR

Relisys 9624T **\$1299**

Highest Optical Resolution Available!

- 2400x600 dpi optical resolution, single pass scanner
- 9600x9600 dpi interpolated resolution with 8.5" x 11.7" scanning area
- Free Transparency Unit ~ 8.5" x 11.7" area ~ \$499 Value!
- Pro Software Package

ArtScan Pro ~ Full Photoshop 3.0 ~ Kai's Power Tools Full ~ Kai's Tips & Tricks CD-ROM ~ OmniPage Direct OCR

MICROTEK

ArtScan Pro ~ Full Photoshop 3.0 ~ Kai's Power Tools Full ~ Kai's Tips & Tricks CD-ROM ~ OmniPage Direct OCR

ScanMaker IISPX **\$625**

Single Pass Color Scanner with Full Photoshop 3.0



- 24-bit scanner captures over 16.7 million colors
- 600x300 dpi resolution, 1200x1200 interpolated
- 8.5" x 11.6" scan frame
- Full Photoshop 3.0 and OmniPage Direct OCR
- Won PC Magazine's Editor's Choice Award

ScanMaker III **\$1899**

36-bit single pass flatbed scanner



- Scan over 68 billion colors
- 1200x600 dpi optical res., 2400x1200 interpolated
- Full Photoshop 3.0, Scan Wizard, and DCR color calibration software, and OmniPage Direct OCR
- Dynamic range near 3:1 for vastly increased detail
- Bonus: Includes free transparency unit \$499 value!

Also, coupon inside for your choice of sheetfed scanner or Fractal Painter 3.0!

Plustek

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The Only Touch-Free™ Solution for Faxing, Copying, Scanning and OCR!



- Portable - about the size of a desktop hole punch
- Action Manager screen lets you choose from twelve definable actions such as copying, faxing, scanning and reading (OCR).
- Scans at 800 dpi, in 256 grayscale and monochrome modes
- Recognita OCR and Action Manager included.

Page Reader 800P **\$199**

- Same as above with parallel port adapter

ScanPlus Color **\$249**

Full-page 24 bit color scanner!



- 24 bit scanning plus 256 grayscale, 1200 dpi
- TWAIN Compliant and HP ScanJet Ilex emulation
- Incredible software value includes iPhoto Plus, Recognita OCR, Business Card Scanner.

ScanFx Color **\$399**

The easy solution for color faxing, copying, scanning & OCR



- Scanning resolution up to 1200 dpi, 24 bit color
- TWAIN Compliant and HP ScanJet Ilex emulation
- Includes Picture Publisher LE & CypherScan Business Card Software and WordScan OCR
- 10 sheet ADF
- Must work with your existing fax card and printer

Scanners

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ES-1000C	\$749
ES-1200C	\$1249
Microtek	
ScanMaker II	\$399
ScanMaker IISPX	\$699
ScanMaker IIIR	\$599
Mustek	
Paragon IISPX	\$399
Paragon 1200	\$499
Paragon Office	\$549
Paragon 800SP	\$499
Color Artist Pro	\$149
Plug & Scan 256 Grayscale	\$179
Plug & Scan Color	\$199
PrinScan Color	\$169
Plustek	
PageReader 800	\$169
ScanPlus Color	\$249
ScanPlus FX	\$399
Relisys	
Awe Office Pro	\$349
Great features, great software, great price	



• 24-bit, 16.7 million colors	
• 8 1/2" x 11.7" scan area	
• 600x300 dpi optical	
• Software included: Photo Studio, Text Bridge, Papermaster, iPhotoScan	
Reli 4816	\$599
Reli 4816T	\$699
Reli 4830T	\$999
Reli 9612T	\$1099
Reli 9624T w/3.0	\$1299

Digitizers

Calcomp	
DrawingBoard III 12x12	\$225
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SummaGraphics	
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• MS Windows, MS mouse emulation	

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SummaSketch III 12x18	\$429

Wacom	
ArtPad II 4 x 5	\$145
ArtPad II 4 x 5 with Dabblor	\$169
ArtZ II 6 x 9 Graphic Tablet	\$349
ArtZ II 12 x 12	\$429

LCD Panels

nView	
nViewZ 110	\$359
nViewZ 115	\$499

Printers

Epson	
Stylus Color II	\$449
Stylus Pro	\$799
Fargo	
Primera Pro color Printer	\$1329
Pictura 310	\$3499
Hewlett Packard	
Call for Prices	CALL

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17" SuperScan Elite - CM1711	\$959
20" SuperScan Pro - CM2011	\$1249
20" SuperScan Elite - CM2008	\$1519
21" SuperScan Elite - CM2111	\$1999
21" SuperScan Supreme - CM2112	\$2499
Sampo	
20" AlphaScan GL - 2055	\$999
20" AlphaScan GLX - 207E	\$1299
Iiyama	
MF 8617E - New!	\$729
MF 9017E - New!	\$859
MF 8221	\$1925
MF 9021	\$1769
MF 9121	\$1829



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Mustek

Paragon 600 IISPX **\$399**

New single pass scanner in a slim-line case!



- Single Pass Color Scanner
- 600x300 dpi optical, 2400x1200 dpi Interpolated
- 24 bit color, 256 grayscale and line art scanning
- Scans up to 8 1/2" x 11"
- Features slim-line case
- Includes i-Photo Plus image editing, Wordlinc OCR and TWAIN software drivers

Paragon 800SP **\$499**

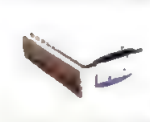
Exceptional 30-bit color!



- Captures over 16 billion colors!
- 800 x 400 dpi optical, 1600 x 1600 Interpolated
- Single Pass Scanner, 30 bit color
- Includes Picture Publisher LE and Wordlinc OCR
- Scan area up to 8.5" x 14" for legal size scans
- Two year warranty includes parts and labor

Paragon 1200 **\$499**

World's Best Value in True 1200 DPI Scanners!



- 1200 x 600 optical, 2400 x 2400 dpi Interpolated
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- SCSI interface, TWAIN compliant
- Adobe Photoshop LE plus Wordlinc OCR

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- Optimized for ease of use, the DrawingSlate is lighter and thinner than other tablets on the market. It also includes a cordless pen with dynamic sensing capabilities.
- 12" x 12" Pressure Sensitive Drawing Tablet
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DrawingSlate II 6x9 **\$195**

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- 32 bit VL bus, 1MB video RAM
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- **IRDA-compliant infrared port**
- **Touch pad pointing device**
- NiMH battery, 2 hours life
- Optional docking station
- Windows 95
- 11.4" X 8.7" X 1.9"
- 6.2 lbs including battery

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- Pointing stick pointing device
- **Optional MPEG, Docking station, Mini Dock**
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- 7.6 lbs including battery

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IBM

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Hinote 4/75 4/340MB Active	ELP	2199	2199
Hinote 4/75 4/510MB Active	ELP	2449	2449
Hinote Ultra 4/75 8/528MB Dual	ELP	2989	2989
Hinote Ultra 4/75 4/340MB Active	ELP	3249	3249
Hinote Ultra 4/75 8/528MB Active	ELP	3549	3549

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755CD 4/100 8/810MB w/CD Act.	ELP	4899	4899
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T2130CS 4/75 8/500MB Dual	ELP	2429	2429
T2130CT 4/75 8/500MB Active	ELP	2989	2989
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T610CT P/90® 8/720MB Active	ELP	4299	4299

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MX21F 21" 28mm	ELP	1739	1739

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Diamond Pro 17XX	ELP	1050	1050
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Diamond Pro 21TX	ELP	1880	1880

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PanaMedia 17 17" 27mm	ELP	860	860
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SONY

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CPD-155F 15" 25mm	ELP	459	459
CPD-175F 17" 25mm	ELP	849	849
GDM-205E 20" 25mm	ELP	1899	1899

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Speedstar Pro 1MB	ELP	\$97	\$87
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Stealth 64 4MB	ELP	464	464
Stealth Video 2MB	ELP	214	214
Viper Pro 2MB	ELP	389	389
Viper Pro 4MB	ELP	534	534

3D

GXE64 2MB DRAM	ELP	\$239	\$239
GXE64 Pro 2MB VRAM	ELP	339	339
GXE64 Pro 4MB VRAM	ELP	509	509
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9FX Motion 771 4MB VRAM	ELP	429	429
9FX Vision 330 2MB	ELP	172	172

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LaserJet 5MP 6ppm 600dpi	ELP	989	989
LaserJet 4+ 12ppm 600dpi	ELP	1394	1394
LaserJet 4M+ 12ppm 600dpi	ELP	1909	1909
Stylus Color II Inkjet 720dpi	ELP	\$429	\$429
Stylus 1000 Inkjet 360dpi	ELP	469	469
ActionLaser 1100 4ppm 300dpi	ELP	379	379
ActionLaser 1400 4ppm 600dpi	ELP	479	479

Canon

BJ-200EX Inkjet 720dpi	ELP	\$199	\$199
BJ-105X 360dpi	ELP	220	220
BJC-600E Inkjet 720dpi Color	ELP	469	469
BJC-4000 Inkjet 360dpi Color	ELP	360	360
LBP-460 4ppm 600dpi	ELP	384	384
LBP-1260 12ppm 600dpi	ELP	1279	1279
MultiPass 1000 Multi-function	ELP	724	724

LEXMARK

Optra R 12ppm 1200dpi	ELP	\$1419	\$1419
Optra L 12ppm 1200dpi	ELP	1869	1869
Optra RX 16ppm 1200dpi	ELP	2000	2000
Winwriter 150C Inkjet 300dpi	ELP	359	359
Winwriter 600 10ppm 600dpi	ELP	994	994

OKIDATA

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OL610e 6ppm 600dpi	ELP	500	500
OL810e 8ppm 600dpi	ELP	744	744
OkJet 2010 Inkjet 600dpi Color	ELP	364	364

brother

HL-630 6ppm 300dpi	ELP	\$399	\$399
HL-645 6ppm 300dpi	ELP	434	434
HL-660 6ppm 600dpi	ELP	585	585
HL-660PS 6ppm 600dpi	ELP	830	830
MFC-4000ML Multi-function	ELP	870	870

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Digital Schoolhouse 4X Kit	ELP	299	299

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145ms Access
\$455 \$435

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PLEXTOR

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6X with Controller	ELP	500	500
6X w/o Controller	ELP	440	440

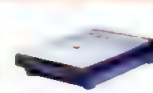
SONY

CSD-760E 4X Int	ELP	\$216	\$216
PRD 150 2X Discman	ELP	335	335
Spressa CD-Recordable	ELP	1750	1750

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XM3601 Quad Speed Ext	ELP	409	409

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Canon

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IX-4015 400dpi Color	ELP	699	699

MICROTEK

ScanMaker IIG 300dpi Grayscale	ELP	\$215	\$215
ScanMaker IIS 300x600dpi Color	ELP	444	444
ScanMaker IIR 600dpi Color	ELP	529	529
ScanMaker II 300x600dpi Color	ELP	354	354
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ES-600C 300dpi Color	ELP	489	489
ES-1000C 400x800dpi Color	ELP	714	714
ES-1200C 600dpi Color	ELP	889	889
ES-1200C Pro 600dpi Color	ELP	1099	1099

MODEMS



Robotics
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Fax Ext.
\$200 \$190

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Sportster SI 14.4/Fax Ext.	ELP	59	59
Sportster 28.8/Fax Int.	ELP	185	185

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MVP288I 28.8/Fax Int.	ELP	\$134	\$134
MVP288XF 28.8/Fax Ext.	ELP	154	154

Hayes

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Accura 14.4B+Fax Ext.	ELP	106	106
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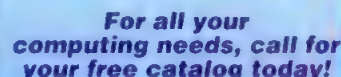
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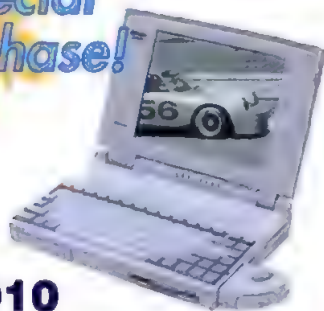
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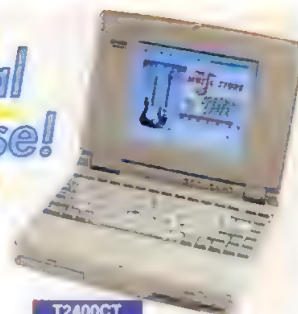
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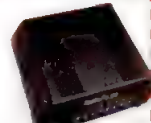


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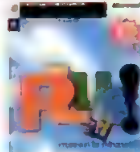
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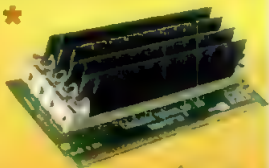
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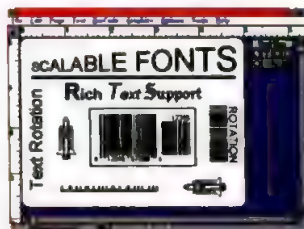
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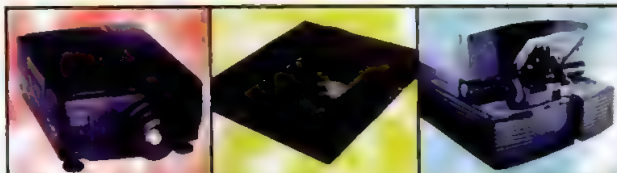


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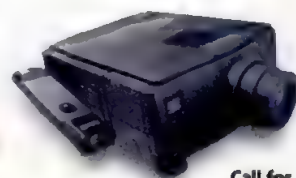
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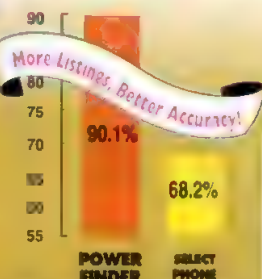
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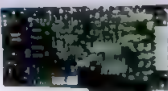
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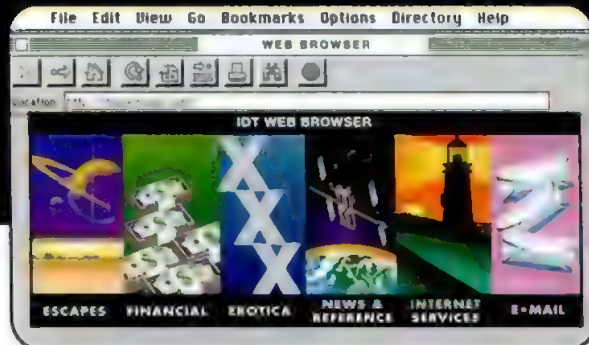
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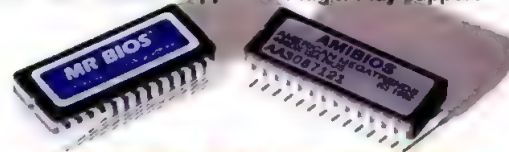
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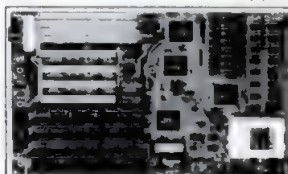
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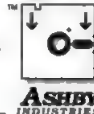
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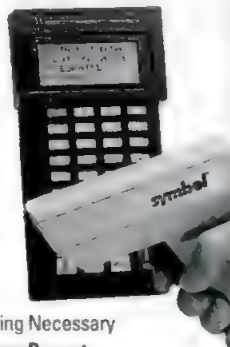


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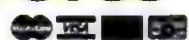
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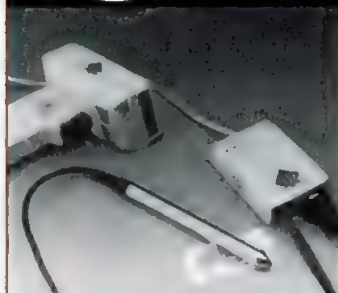
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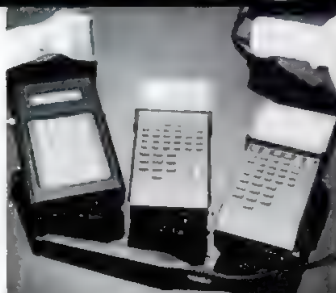


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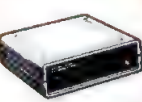
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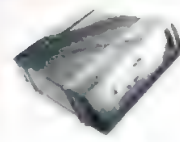
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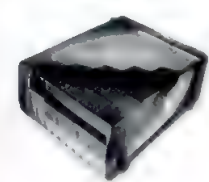
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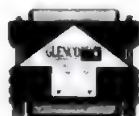
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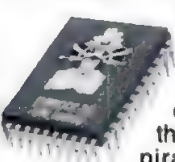
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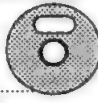
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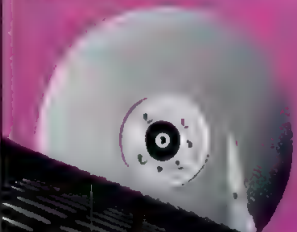
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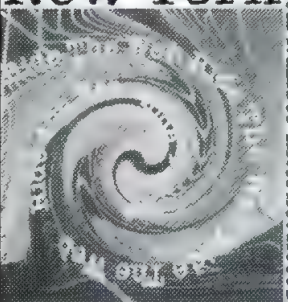
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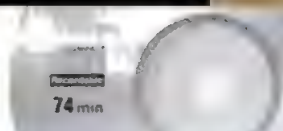
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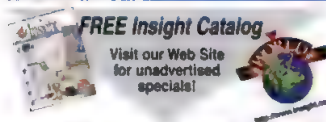
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EDITOR'S RATINGS: ★ Poor ★★ Fair ★★★ Good ★★★★ Excellent

☐ DOS ☐ Windows ☐ CD-ROM ☐ Resource-Intensive ☐ Adult Content ☐ Kids (Ages) ☐ Price

Cooking on CD-ROM

Have you ever wondered why cooking programs are never on TV when you're ready to cook? Or maybe you don't know how to cut butter into flour, and your cookbook doesn't do much in the way of explaining. These four CD-ROMs can remedy both those problems with style, flair, and sometimes, wit.

Inspiration and instruction is just a mouse-click away with these multimedia-rich offerings. They offer cooking instruction, recipes, tips, and tricks on demand. Intelligent search engines, shopping list generators, photos of completed dishes, instructional video clips, and recipes that are both interesting and fun combine to make these CD-ROMs really cook. So tie on an apron, fire up the stove, pop one of these CD-ROMs in your PC, and start cooking.

Cooking with Dom DeLuise: Fun, Fast and Healthy

Allegro NewMedia, 201-808-1992.

Circle 460 on reader service card

★★★★★ ☐ ☐ ☐ \$49.95

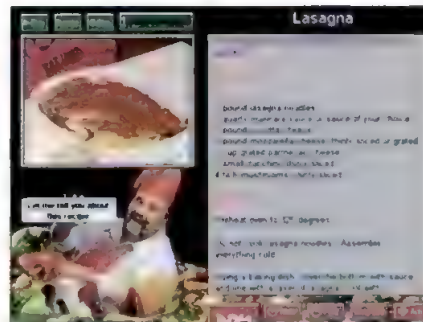
Cooking with Dom DeLuise: Fun, Fast and Healthy delivers exactly what it promises: healthy, easy-to-prepare food, served up with a lot of laughs. This two-CD set contains over 200 recipes aimed at both beginning and advanced chefs who don't take cooking too seriously.

All the recipes are easy to access, thanks to a simple point-and-click interface and careful organization. Disk 1 contains meat, poultry, fish, eggs, pasta, and soup recipes; Disk 2 contains sauces, breads, salads, appetizers, vegetables, and desserts. Most of the recipes are Italian in flavor, though you'll find other cuisines represented as well. All the recipes are sim-

ple and easy to follow, and can be automatically doubled in serving size.

To find just the right recipe, you can search by ingredient or combination of ingredients, including herbs and spices. This is a handy feature for those times when your friend gives you a basket of tomatoes and zucchini from his garden and you can't figure out what to do with them. You can add your own recipes to the database or edit existing ones, then print them out to carry with you to the kitchen. When you've decided what to cook, you can create a shopping list by simply dragging and dropping ingredients from the recipe to the shopping list.

Many of the recipes include video clips that are sometimes educational, explaining a technique, or offering a cooking trick, and almost always humorous. Don't miss Dom using his CD-ROM drive as a juicer.



Cooking with Dom DeLuise will have you laughing as you prepare Italian dishes.

All in all, *Cooking with Dom DeLuise: Fun, Fast and Healthy* is a great choice for its basic recipes and relaxed approach.

Julia Child Home Cooking With Master Chefs

Microsoft Corp., 800-426-9400.

Circle 461 on reader service card

★★★★★ ☐ ☐ ☐ \$39.95

Julia Child Home Cooking with Master Chefs is like a television cooking show and a glossy coffee table book rolled into one. The program is divided into four main sections: Chefs, Lessons, Recipes, and Julia's Kitchen.

The Chefs section presents

biographical information on each of the 16 guest chefs, whose names you'll recognize from PBS, such as Lidia Bastianich, Patrick Clark, and Alice Waters. You'll also find recipes and cooking tips from the chefs.

The Lessons are where you'll turn to learn how to prepare

some of these fantastic dishes. The chefs explain the process through video and audio clips. The complete recipe and a list of ingredients is provided as well. Double-click on an ingredient and a complete description, tips on using the ingredient, and a close-up photo will appear. For example, double-click on the word garlic in any recipe and you will learn that whole garlic cloves in a sauce will impart a subtle flavor, whereas mashed garlic will release its full flavor.

The Recipes section contains a list of all the recipes included on the CD-ROM, divided into 14 categories, such as appetizers, seafood, and

AFTER HOURS INDEX	
Cooking on CD-ROM	Reference
<i>Cooking with Dom DeLuise: Fun, Fast and Healthy</i>377	<i>Microsoft Wine Guide</i>381
<i>Julia Child Home Cooking with Master Chefs</i>377	Quick Clips
<i>The Art of Making Great Pastries</i>378	<i>Family Pets</i>
<i>Micro Kitchen Companion, Version 4.0</i>378	<i>Holiday Activity Fun Pak</i>
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	<i>Full Throttle</i>382
	Adventure
	<i>Space Quest 6: Roger Wilco in The Spinal Frontier</i>382

After Hours

poultry. Select a category and you'll receive thumbnail photos of the completed dishes within it, as well as a link to any appropriate lessons.

If you need to learn more about the tools of the trade, then head to Julia's Kitchen. An audio clip of Julia Child will guide you through a tour of the kitchen that includes instruction in photos and text on how to sharpen knives, how to open, pour, and serve wine, and how to tell the difference between varieties.

Slick production values



Learn about food and wine techniques with Julia Child Home Cooking.

and gourmet recipes highlight this high-brow cooking CD-ROM that will make your mouth water.

The Art of Making Great Pastries

Cambrix Publishing, 800-992-8781.

Circle 462 on reader service card

★★★★ \$69.95

Few people can say no to pastry, and The Art of Making Great Pastries just made it even harder. This CD-ROM is crammed with over 100 recipes created by European chefs, basic and advanced technique demonstrations, detailed explanations of ingredients, and

recipe-searching based upon dessert characteristics.

The CD's main menu provides access to baking techniques presented through a combination of video and audio clips. Here you'll receive step-by-step instructions—from rolling cookie dough to

making pie crust—from a professional chef. You also can learn more about the basic ingredients used to make pas-



Master the art of dessert with The Art of Making Great Pastries.

tries and what to look for when buying them.

The real strength of this package lies in its recipe search function. Searches are based on simple criteria such as: cream-based, cake or sponge, fruit, degree of complexity, and preparation time. Choose the items that matter to you, and the program will create a list of appropriate recipes. Click on one of the dessert names on the list and you'll see its photo, as well as its cooking/baking time, relative cost, level of complexity, and list of ingredients. Just click on the word bake, and you get the complete recipe.

All recipes can be printed and notes added as desired. You can't scale recipes, but that is more a characteristic of baking cakes and pastry than a flaw in the program. The one real drawback here is that the interface is attractive, but not particularly intuitive. Still, the recipes are good and the instruction well-thought-out enough to turn anyone into a gourmet baker.

Micro Kitchen Companion Version 4.0

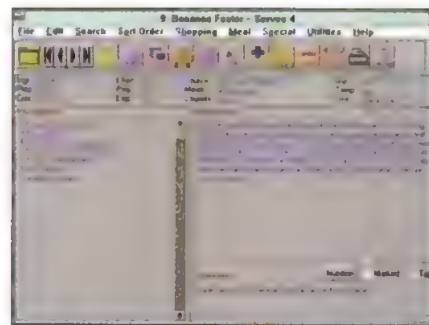
Lifestyle Software Group, 904-825-0220.

Circle 463 on reader service card

★★★★ \$49.95

Micro Kitchen Companion Version 4.0 presents itself as a meal planning system, rather than just a cookbook. Though not as multimedia-rich as the other CD-ROMs reviewed here, this program includes the largest selection of recipes—over 1,000 dishes—as well as nutritional information for all those recipes.

The recipes are broken down into two categories: A



Plan a menu or choose from the 1,000 recipes in Micro Kitchen Companion.

Taste for All Seasons and A Taste of Home. A Taste for All Seasons offers a mix of international and American recipes

Blockbuster Video Guide to Movies and Videos

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CD-ROM PICK HIT



low price and you'll understand why we think this title is a blockbuster.

—Shane Mooney

Creative Multimedia, 800-262-7668

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★★★★ \$19.95



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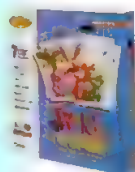
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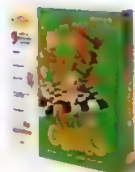
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culled from famous restaurants from around the country. A Taste of Home includes a whopping 811 recipes spanning everything from things grandma would cook, to picnic and cook-out foods. You can modify, print, and scale recipes to 999 servings, something no other title can accomplish. You also easily can create a shopping list directly from a recipe.

The program also includes a menu planning option that sorts the recipes by any field, allows searches on ingredients (or lack of them for those of us with an aversion to peas, for instance), preparation time, or nutritional content. Short audio/video clips are used to explain cooking techniques throughout.

If you're looking for good old-fashioned recipes, and lots of them, Micro Kitchen Companion is hard to beat.

—Michael J. Zulich

Reference

To Merlot or Not to Merlot

Microsoft Wine Guide

Microsoft Corp., 800-426-9400

Circle 464 on reader service card

★★★★  \$29.95

Even if you've never been able to tell a Chardonnay from a Cabernet, you'll soon be able to help a Merlot find its match with the Microsoft Wine Guide.

Renowned wine expert Oz Clarke is your guide to this tour of the wonderful world of vino. The program breaks down into four sections: Wine Tasting with Oz, All About Wine, World Atlas of Wine, and Wine Encyclopedia. Wine Tasting offers instruction in

QUICK CLIPS

Recommended
It's Your Call
Not Recommended

? Family Pets

If you've been longing for somewhere to record all your pet's vital data, you'll want this CD-ROM. But do you really want to have to decipher a somewhat obtuse interface to record Fido's fondest memories? \$19.95, FamilyWare Products Inc., 800-313-7333.

🏠 Holiday Activity Fun Pak

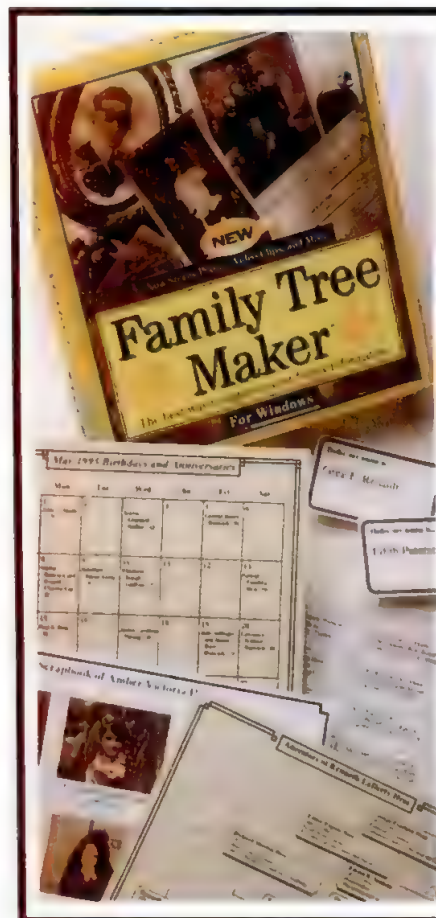
Four Christmas-themed activities that will keep kids ages 3 to 6 busy till Santa comes to call. The Decorate the Christmas Tree game was a personal favorite. \$14.95, T/Maker Co., 800-986-2537.

👉 Man Ray

The 600 photos from this well-known surrealist artist's portfolio certainly are beautiful, but try to figure out what they are or how you get to them. Everything here is in French, and there's no interface—just a Photo CD viewer to guide you through the CD-ROM. \$39.95, D&D Computers, 800-816-6848.

🏠 Totally Twisted After Dark Screen Saver

The sickest screen saver ever lets you hunt mimes, mow down cuddly kitties . . . and more. The perfect choice for those who usually find screen savers too cute for pictures. \$30, Berkeley Systems, 510-540-5535.



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SPOTLIGHT ON ADVENTURE

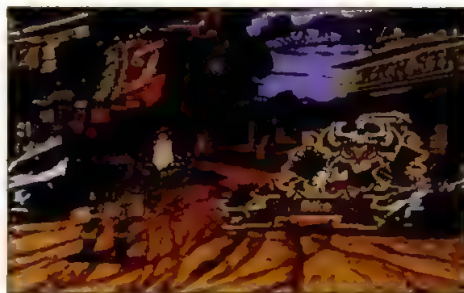
Full Throttle

Full Throttle, a full-on adventure game, serves up an interactive cartoon with a Road Warrior attitude. You play the reluctant hero, rough and tumble Ben, leader of the Polecats, a post-apocalyptic motorcycle gang. Ben is framed for murder. His goal: to repair his busted-up bike, get on the road, and expose the real killer for the suburban yuppie scum that he is.

Full Throttle is full of smooth cartoon-like animation, top-rate voice acting (Mark Hamill provides the voice of the villain), digitized sound effects, and a garage-band rock soundtrack. There are plenty of extended animation sequences that advance the story, but stare at them too long and you'll lose the fight sequences and end up scraping leather and flesh all over the road.

Veteran adventure gamers might grouse at the action-arcade fight sequences or grumble at the long narrative sequences, but

there's no denying that Full Throttle's visual and aural treats are impressive and attention-grabbing. This is the perfect adventure for new CD-ROM owners who want to test



the game waters. Our only complaint? Full Throttle revs down too soon.

—Bernard H. Yee

LucasArts, 800-867-0413.

Circle 465 on reader service card

★★★★ CD-ROM \$49.95

wine basics. The World Atlas of Wine takes you through the major growing regions of the world, while the Wine Encyclopedia provides an indexed reference to all the wine terms

for in a wine—everything from country of origin and type of wine to what food you want it to accompany—so the program can recommend the perfect wine. With a few simple



The Microsoft Wine Guide can quickly turn you into a connoisseur.

used on the CD-ROM.

All About Wine offers instruction on reading a wine label. The highlight is the Wine Selector, which lets you set the criteria you're looking

clicks, you'll find out that Chianti is the perfect Italian wine to sip as you wolf down spaghetti with meatballs. So drink up!

—Michael J. Zulich

Adventure

The Return Of the Space Janitor

Space Quest 6: Roger Wilco in The Spinal Frontier

Sierra On-Line, 800-757-7707.

Circle 466 on reader service card

★★★★ CD-ROM \$59.95

Space Quest 6: Roger Wilco in The Spinal Frontier shamelessly borrows its name from the fifth Star Trek movie, "The Final Frontier," and this sets the game's tone. If you're a fan of science-fiction movies past and present, many of the antics in this game will seem familiar. The majority of the story at the heart of Space Quest 6 is fairly predictable, offering

some belly laughs, but few sophisticated plot twists.

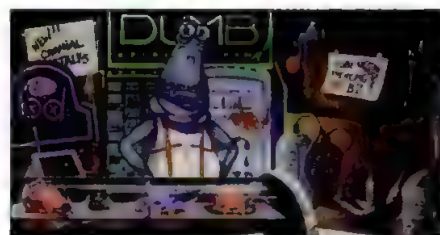
In this latest installment in the popular Space Quest series, we find our hero, Roger Wilco, in DeepShip—the SCS DeepShip 86 to be exact. This is his latest janitorial commission since being demoted for his Space Quest 5 antics. But leave it to Roger, whose mastery of the moronic is unparalleled, to get himself in trouble.

You spend the first half of the game wandering around exploring your environment by clicking on everything, all while you try to stay out of trouble. Things begin to get fun when Roger gets injected into the bloodstream of crew member Stellar Santiago. Roger must traverse her major organs to get to her brain and stop the evil Sarpei from wreaking havoc on Stellar.

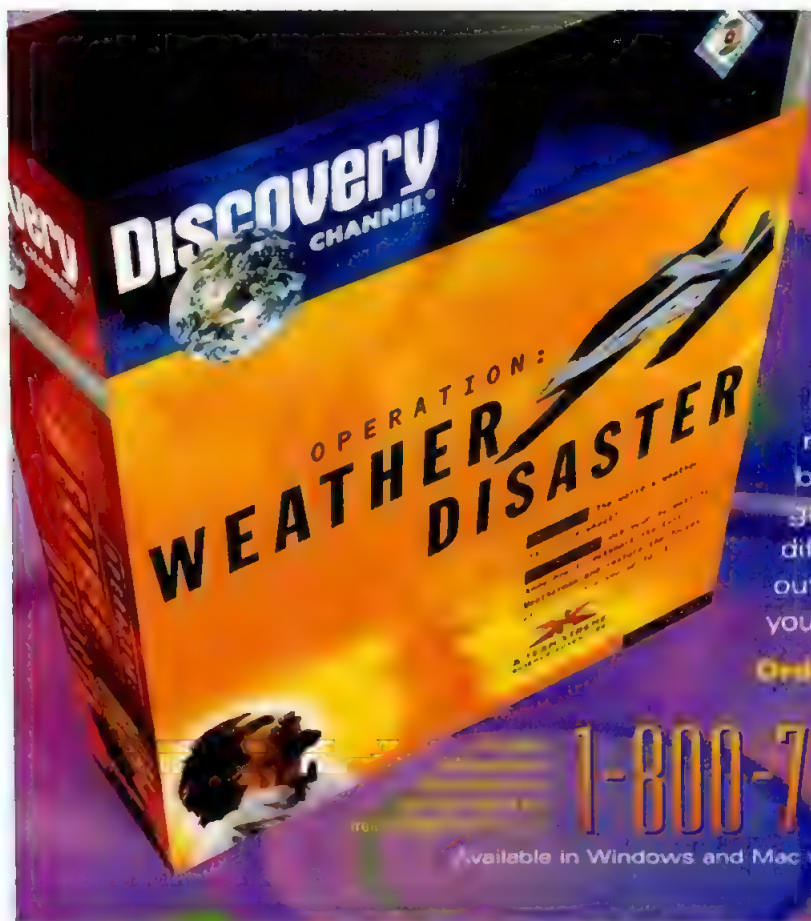
The animation is superb, and the game play involving, but those who require an original plot should look elsewhere. The story line and characters of Space Quest 6 are largely cartoon versions of those found in other science fiction works. For example, one sequence has you meeting up with an Endroid Runner who's searching for a psycho 'droid, a big guy with a crew cut, dark jacket, and a strange accent. Sound familiar?

Fans of the series will enjoy the spiffy graphics and twisted sense of humor. But if you're looking for an original plot, your quest should continue.

—Shane Mooney



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Coming Up

A Pentium for Every Desktop

Are you thinking of buying a new PC but unable to decide whether to join the new generation of Windows 95 users or stick with a known quantity like Windows 3.x? Our annual PC Buyers' Guide may have just the answers you're looking for. Using our new benchmark tests—which include an exciting and informative set of tests that measure your PC's multimedia capabilities—PC Magazine Labs puts 103 Pentium PCs from more than 50 vendors through their paces. We cover virtually the entire Pentium spectrum—from midrange 90-MHz machines to top-of-the-line Pentium/133-powered systems—running our new benchmark tests under both Windows 95 and Windows 3.x to help you make an informed buying decision.

PENTIUMS RUNNING WINDOWS 95 Windows 95 has exploded onto the desktop scene, bringing with it promises of a easier-to-use, more powerful, and more robust computing interface for all. Was it worth the wait? And does it deliver on its promises? PC Magazine Labs puts 83 Pentium PCs running Windows 95 to the test to find out.

PENTIUMS RUNNING WINDOWS 3.X Yes, Windows 95 is here, but many corporate installations may still be approaching this new operating system with a wait-and-see attitude, envisioning high costs to entry—including site license fees, training, and learning-curve downtime. After all, Windows 3.x does work, and if it ain't broke, why fix it? For the hesitant and the holdouts, PC Magazine Labs examines 20 network-ready Pentium machines running Windows 3.x to find which are worthy of a place in your corporation.

BUILDING YOUR DREAM MACHINE The task of buying a new computer can be a rather daunting one at best. With new technologies and componentry available on what may seem like a daily basis, how can you be sure that what you're purchasing isn't going to be outdated in a matter of months? To help guide you along in the purchase decision process, we've assembled a buyers' checklist of components that you should consider carefully before buying a new PC—including our recommendations for putting together a system that will take you into the future.

Cutting-Edge Code Editors

Even though it's the era of IDEs, lots of programmers still prefer the power and flexibility of a standalone code editor. PC Tech reviews four leading Windows-based code editors, from American Cybernetics, MicroEdge, Premia, and Wilson WindowWare.

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